SELECTED WATER RESOURCES ABSTRACTS

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JULY 15, 1978

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 14
JULY 15, 1978

W78-06201 -- W78-06700

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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For primary bibliographic entry see Field 6E.
W78-06217

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Canada Centre for Inland Waters, Burlington (Ontario).
P. F. Hamblin, and E. C. Carmack.
Journal of Geophysical Research, Vol 83, No C2, p 885-899, February 20, 1978. 13 fig, 3 tab, 24 ref.

Descriptors: *Lakes, *Canada, *Rivers, *Currents(Water), *Model studies, Mathematical models, Temperature, Water temperature, Turbidity, Density, Flow, Entrainment, Mixing, Friction, Flow friction, Dye releases, Limnology, *Kamloops Lake(British Columbia), *Thompson River(British Columbia).

Models based on stream tube geometry and geostrophy were used to describe the passage of a strong river through a long narrow (fjord-type) lake. Analysis was applied specifically to the entry of the Thompson River into Kamloops Lake, British Columbia. Lake-river interaction was considered in three stages of flow: a sinking plume stage during which the incoming river water sinks to a depth where its density matches that of the incoming river, a horizontal spreading stage during which the movement of river water is unconstrained by bottom and/or shoreline effects, and a shorebound stage during which the flow of river water downlake occurs principally in a balance between cross-stream pressure gradients and the Coriolis force. Echanges of mass and momentum were parameterized by entrainment and friction coefficients evaluated from field data. Results of this study showed, in general, that river-induced currents influence or even dominate circulation patterns within a fjord lake. (Sims-ISWS)
W78-06219

A MONTHLY WATER BALANCE MODEL INCLUDING DEEP INFILTRATION AND CANAL LOSSES,
Vrije Univ., Brussels (Belgium). Lab. of Hydrology.
A. Van Der Beken, and J. Byloos.
Hydrological Sciences Bulletin, Vol 22, No 3, p 341-351, September 1977. 5 fig, 2 tab, 3 ref.

Descriptors: *Water balance, *Model studies, *Infiltration, Seepage, Monthly, Hydrologic budget, Precipitation(Atmospheric), Streamflow, Evaporation, Base flow, Hydrology, Canals, *Canal water losses, *Belgium, *Grote Nete test basin(Belgium).

A monthly water balance model was applied successfully to the Grote Nete test basin (553 sq km) in the North of Belgium. This low region has a complex geological structure. Its boundaries are more of less unknown, and deep infiltration into a deep aquifer is most likely to occur. Moreover, the area is crossed by several navigation canals which import and export an unknown volume of water. The inputs were monthly precipitation and Penman potential evapotranspiration values. The model computes actual evapotranspiration, water storage in the basin, direct runoff and infiltration, baseflow and total stream discharge, deep infiltration loss into the underlying aquifer, and constant seepage from the canals. The 'pattern search' procedure, was used for automatic optimization of the six model parameters. All parameters have a physical meaning and can be evaluated initially. For the calibration period 1967-1972, total stream discharge was calculated with a precision of 0.2% compared to total measured volume. The correlation coefficient is 92% for the same calibration period. Prediction for the period 1973-1974 gave a volume precision of 8.7% and a correlation coefficient of 93%. (Lee-ISWS)
W78-06220

AOIPS WATER RESOURCES DATA MANAGEMENT SYSTEM,
Earth Satellite Corp., Washington, DC.
For primary bibliographic entry see Field 7C.
W78-06239

THE DYNAMICS OF STRATIFICATION AND OF STRATIFIED FLOW IN LARGE LAKES.
International Joint Commission-United States and Canada, Windsor (Ontario). Standing Committee on the Scientific Basis for Water Quality Criteria.
For primary bibliographic entry see Field 2H.
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NOTES ON RECENT RESEARCH ON SIMULATION OF TWO-DIMENSIONAL STRATIFIED FLOWS,
Resource Management Associates, Lafayette, CA.
For primary bibliographic entry see Field 2H.
W78-06395

SAFETY OF DAMS, A REVIEW OF THE PROGRAM OF THE U. S. BUREAU OF RECLAMATION FOR THE SAFETY OF EXISTING DAMS.
National Research Council, Washington, D.C. Committee on the Safety of Dams.
For primary bibliographic entry see Field 8B.
W78-06522

CALIBRATION OF HYDROLOGICAL MODEL USING OPTIMIZATION TECHNIQUE,
Severn-Trent Water Authority, Birmingham (England).
R. E. Manley.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 104, No. HY2, p 189-202, February 1978. 4 fig, 3 tab, 20 ref.

Descriptors: Water resources, *Optimization, *Simulation analysis, *Computer models, Digital computers, Hydrology, Hydraulics, Surface waters, Groundwater, Conservation, Droughts, Wave velocity, *Mathematical models, Systems analysis, Equations, Model studies, Algorithms.

Computer-based mathematical models that simulate the response of a catchment to climatic variables have been available for more than a decade. One of the drawbacks to the use of these models has been the difficulty of calibrating them to a particular catchment. The catchment model HYSIM has all but four of its parameters estimated from catchment details or hydrograph analysis; the four are calibrated using a modified version of the Rosenbrock algorithm. The complete model occupies about 12K words (36K bytes) of computer core storage. HYSIM was used to produce a 44-year record for a river in England extensively used for water supply. Despite the fact that only a limited amount of data was available, the extended record has proven adequate for water resources analysis. (Bell-Cornell)
W78-06561

APPLICATION OF A RAINFALL-RUNOFF MODEL IN ESTIMATING FLOOD PEAKS FOR SELECTED SMALL NATURAL DRAINAGE BASINS IN TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06602

2B. Precipitation

THE 1976 DROUGHT IN FRANCE: CLIMATOLOGICAL ASPECTS AND CONSEQUENCES (LA SECHERESSE 1976 EN FRANCE: ASPECTS LIMATOLOGIQUES ET CONSEQUENCES),
Direction de la Meteorologie, Boulogne-Billancourt (France).
P. Brochet.
Hydrological Sciences Bulletin, Vol 22, No 3, p 393-411, September 1977. 10 fig, 2 tab.

Descriptors: *Droughts, *Surface waters, *Climatology, *Rainfall, Water pollution, Agriculture, Soil water, Water storage, Hydrologic budget, Rainfall disposition, Navigation, Transport, Rivers, Data collections, Foreign research, Meteorology, Maps, Weather data, Synoptic analysis, Meteological data, Runoff, Hydroelectric power, Water utilization, *France.

The four classical definitions of drought were mentioned: (1) pluviometric drought, numerically characterized by a pluviometric ratio; (2) climatic drought, depending on the potential water budget; (3) agricultural drought, referring to the easily available soil water storage; and (4) hydrological drought, recognized by an anomaly in the water supply to the water courses. The first two types were analyzed with respect to the 1976 drought in France, and the results were plotted on maps. The meteorological causes of the drought were examined, using data from Europe and North Africa. Finally, the effects of the drought on surface water (groundwater does not appear to have been affected), river transport, pollution, hydroelectric power supply, and above all on agriculture, were given. (Humphreys-ISWS)
W78-06221

CLIMATIC EFFECTS ON WASTEWATER TREATMENT,
North Dakota State Univ., Fargo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-06305

CLIMATIC AND ECOLOGICAL ASPECTS OF DESERTIFICATION,
New South Wales Univ. (Australia). School of Geography.
J. A. Mabbutt.
Nature and Resources, Vol. 8, No. 2, p 3-9, April-June, 1977.

Descriptors: *Deserts, *Environmental effects, *Ecology, *Climates, Arid lands, Semiarid climates, Droughts, Rainfall, Africa, Albedo, Subclimax, Grazing, Weather forecasting, Land management, Land reclamation, *Desertification.

Desertification is the spread of desert conditions beyond desert margins, or the intensification of desert conditions within them. The problem of increasing desertification is examined and its causes are discussed. The primary focus is upon the climatic and ecological aspects. Questions explored concerning climate and desertification are concerned with man's effect on deterioration of desert climates, the problems of weather forecasting, and the possibility of man changing the desert/climate to his advantage. The value of using an ecological approach in dealing with the problem of desertification is examined. The physical processes of desertification are discussed. (Jamail-Arizona)
W78-06338

GREATEST KNOWN AREAL STORM RAINFALL DEPTHS FOR THE CONTIGUOUS UNITED STATES,
NOAA National Weather Service, Silver Spring, MD. Office of Hydrology.
For primary bibliographic entry see Field 7C.
W78-06380

WEATHER MODIFICATION ACTIVITIES IN KANSAS 1972-1977,
Kansas Water Resources Board, Topeka.
For primary bibliographic entry see Field 3B.
W78-06382

2C. Snow, Ice, and Frost

SATELLITE IMAGES OF LAKE ERIE ICE: JANUARY-MARCH 1975,
National Environmental Satellite Service, Washington, DC.
M. C. McMillan, and D. Forsyth.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 458, Price codes: A02 in paper copy, A01 in microfiche. NOAA Technical Memorandum NESS 80, June 1976. 18 p, 18 fig, 1 ref.

Descriptors: *Remote sensing, *Great Lakes, *Ice cover, *Lake Erie, Satellites(Artificial), Radiation, Infrared radiation, Photography, Clouds, Lakes, Ice, Lake ice, Freezing, Melting, Radiometers, Visible imagery, Thermal imagery.

The NOAA-4 environmental satellite provides daily images of portions of Earth in the visible (0.6 to 0.7 micrometer) and thermal (10.5 to 12.5 micrometer) spectral regions from a Very High Resolution Radiometer (VHRR) having approximately 1-km resolution. This improved resolution has permitted more detailed observations of Great Lakes ice than was possible with the previous generation of operational satellites. Both visible and infrared imagery were presented to show ice formation and dissipation in Lake Erie and vicinity. Coverage began on January 21 and ended on March 18, 1975. Only cloudfree or partly cloudy imagery was included. (Sims-ISWS)
W78-06231

BIBLIOGRAPHY ON COLD REGIONS SCIENCE AND TECHNOLOGY, VOLUME XX-VIII, PT. 1.
Cold Regions Research and Engineering Lab., Hanover, NH.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A007 092, Price codes: A14 in paper copy, A01 in microfiche. CRREL Report 12, July 1974. 304 p.

Descriptors: *Bibliographies, *Cold regions, *Technology, Abstracts, Publications, Information retrieval, Snow, Ice, Frost, Permafrost, Documentation, Ice cover, Tundra, Temperature, Glaciers, Lakes, Remote sensing, Glaciology, Exploration, Polar regions, Antarctic, Arctic, Indexes.

The Bibliography on Cold Regions Science and Technology, CRREL Report 12, is a continuing publication of the Cold Regions Bibliography Project in the Science and Technology Division of the Library of Congress. The present volume contains material accessioned between July 1973 and June 1974. The volume consists of two parts, each separately bound. Pt. 1 contains the full citation of 4312 items, in many cases with abstracts. Pt 2 is an index section is an index section divided into author and subject indexes. In the author index, principal and joint personal and corporate authors are listed along with the title, date, pagination, and language of the document and the accession number. The subject index is composed of three basic elements: (1) terms taken from a controlled vocabulary based on the Thesaurus of Engineering and Scientific Terms (LEX-EJC), (2) free terms added as needed, and (3) geographic names, generally entered under countries. The terms are listed in a single alphabetical arrangement, along with title (original, translated, abridged, expanded, or supplied), principal author, date, pagination, and language of pertinent documents, and their accession numbers. (Froehlich-ISWS)
W78-06232

INVESTIGATION OF THE FLOW OF NATURAL ICE,
S. K. Khanina, and A. R. Shul'man.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 677, Price codes: A02 in paper copy, A01 in microfiche. Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, Draft Translation TL 525, May 1976. 16 p, 8 fig, 2 tab, 8 ref. Translated from Trudy Gosudarstvennogo Gidrologicheskogo Instituta, No. 16, pt. 70, p 89-95, 1949.

Descriptors: *Ice, *Flow, *Rivers, *Lakes, Elastic deformation, Deformation, Lake ice, On-site investigations, Sampling, Laboratory tests, Crystallography, Crystals, Viscosity, *USSR.

The structure of natural ice from the Neva and Volkhov rivers and from Ladoga and Suzdal' lakes was investigated during January-April 1948. River ice crystals resembled artificial ice crystals in size. Tests indicated that deformation is a function of time, the load, and the direction of application of the load in relation to the optical axis of the ice crystals. Maximum deformation occurred when the load was applied perpendicularly to the optic axis of the crystals. Deformation increased with time. The viscosity was less in monocrystals than in river ice. (Sims-ISWS)
W78-06233

DEVELOPMENT OF A HYDROPHOBIC SUBSTANCE TO MITIGATE PAVEMENT ICE ADHESION,
Ball Bros. Research Corp., Boulder, CO.
For primary bibliographic entry see Field 4C.
W78-06241

DEVELOPMENT AND EVALUATION OF AN EXPERIMENTAL FRAZIL ICE MEASUREMENT INSTRUMENT,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
G. Tsang.
Scientific Series No. 78, 1977. 35 p, 12 fig, 1 tab, append.

Descriptors: *Frazil ice, *Measurement, *Instrumentation, Evaluation, Conductivity, Laboratory tests, *Instrument development project.

Theoretical investigations show that the presence of frazil ice in water can be quantitively measured by its effect on the conductivity and the permittivity of the water. At frequencies much lower than 10 to the seventh power Hz, the fraxil ice effect on conductivity predominates, and at frequencies much higher than 10 to the seventh power Hz, the ice effect on permittivity is predominant. An experimental instrument based on the resistance (i.e., conductivity) principle has been constructed and tested. Experiments were performed in a cold room with fraxil ice produced in a beaker. The experiments showed that the laboratory instrument could quantitatively sense the presence of ice. The detailed circuit of the experimental instrument is shown. Some modifications of the circuit and the probe for improving the instrument are suggested as a consequence of the laboratory experiments and further theoretical investigations. The concentrations of frazil ice measured by the experimental instrument were by average about three times the concentration calculated theoretically. If the frazil ice crystals are assumed to have elongated spheroidal shapes with a length to breadth ratio of 10 to 1, the measured concentrations are about twice the calculated concentration. Further theoretical investigation is needed to explain this puzzle. The puzzle, however, is beneficial because it increases the sensitivity of the instrument. This report describes phase I of an instrument development project. The design and production of an improved and manufacturable instrument will be phase II of the project. (WATDOC)
W78-06313

FLASH FLOOD FORMATION IN PERMAFROST REGIONS,
F. V. Zalesskiy.
Soviet Hydrology, Selected Papers, Vol 15, No 2, p 95-97, 1976. 1 tab. Translated from Trudy IV Vsesoyuznogo Gidrologicheskogo S'yezda, Vol 3, p 40-44, 1975.

Descriptors: *Flash floods, *Permafrost, *Cold regions, Seepage, Runoff, Foreign countries, Foreign research, Storms, Rainfall, Precipitation(Atmospheric), Floods, Groundwater, Groundwater movement, Hydrology, *USSR.

The conditions of formation of the flash flood peak in the Soviet Northeast, i.e., in regions ith continuous permafrost, were analyzed on the basis of the data of the Kolyma and Yakutsk Hydrometeorological Service Administrations, particularly observations of the Kolyma hydrologic station, and of personal observations over 14 years of engineering surveys of roads, dams, channel outlets, and other hydraulic installations in the Northeast. Emphasis was placed on small basins, since maximum runoff from such basins is the least resolved engineering hydrology problem. Maximum discharge was usually determined on the basis of surface runoff over slopes. It also was assumed that the entire basin area can participate in flood peak formation. Surface runoff from slopes is hardly ever observed during flash floods in the region in question. This is attributable to the uniqueness of the underlying surface (moss cushion, tundra, etc.) and to the absence of high-intensity rainfalls. therefore, storm seepage-groundwater runoff on slopes were analyzed. (Sims-ISWS)
W78-06402

2E. Streamflow and Runoff

VALIDATION AND IMPLEMENTATION OF A SIMPLIFIED STREAMFLOW SIMULATOR,
Nebraska Univ., Lincoln. Dept. of Computer Science.
A. J. Surkan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 108, Price codes: A09 in paper copy, A01 in microfiche.
Nebraska Water Resources Institute, Lincoln, Completion Report, (1977). 179 p, 19 fig, 3 tab, 5 ref, 2 append. OWRT B-031-NEB(2). 14-31-0001-5088.

Descriptors: *Model studies, *Computer models, *Simulation analysis, Nebraska, *Computer programs(HYDRA), Illinois, North Carolina, Streamflow, *Storm runoff, Monitoring, Flood forecasting, Drainage basins.

Three diverse basin types were selected to demonstrate the ability of the HYDRA package computer programs to successfully simulate the effects of storm events. The Hooper Creek Contributary is an eight-square-mile basin located in a rural area near Eagle, Nebraska. The Oakdale Basin is a small 13-acre residential area in Chicago, Illinois. The Tar Branch Basin drains an area of 384 acres including parts of downtown Winston-Salem, North Carolina and adjacent industrial areas. The results obtained are reported in a manuscript included as an appendix. Both channel and distributed network representations were used for the Hooper Basin. Oakdale and Tar Branch were represented as distributed networks. The results obtained using HYDRA for the Tar Branch Basin were comparable to those obtained using the Road Research Laboratory method and the ILLUDAS method. The results for the Hooper and Oakdale Basins showed that HYDRA was highly successful in the simulation of storm runoff responses for the conditions of the watersheds at the time of the storms studied. The second appendix documents the programs of the HYDRA package for users wanting to operate and adapt the system for a wide range of applications. The HYDRA package's versatility coupled with its ability to simulate the effects of a storm moving over the network should help to identify those patterns of storm speed and direction which have the potential of producing abnormally sharp increases in flow volume. The HYDRA package could also be used as a system dedicated to the real-time monitoring of potential flood sites with the foal of minimizing damage by providing timely warning of flood conditions.
W78-06205

FLOOD ROUTING BY THE MUSKINGUM METHOD,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
M. A. Gill.
Journal of Hydrology, Vol 36, No 3/4, p 353-363, February 1978. 7 fig, 2 tab, 5 ref.

Descriptors: *Flood routing, Equations, *Rivers, Streamflow, Hydrology, Surface waters, Mathematical studies, Least squares method, Numerical analysis, Channels, *Muskingum method.

The coefficients k and x in the linear Muskingum equation were determined by the least-squares method (LSM). A routing scheme was proposed for situations where the storage and weighted flow relationship is nonlinear. Although the routing coefficients in the nonlinear equation were not determined by LSM, an alternative working method was proposed. Another simple method for nonlinear flood routing was proposed which was called herein the segmented- curve method. The coefficients in this method were determined by LSM. This method involved only slightly more work than was required in the linear Muskingum method which is inaccurate in nonlinear problems. (Lee-ISWS)
W78-06211

ALGEBRAIC SOLUTION OF THE HORTON-IZZARD TURBULENT OVERLAND FLOW MODEL OF THE RISING HYDROGRAPH,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
M. A. Gill.
Nordic Hydrology, Vol 8, No 4, p 249-256, 1977. 2 fig, 8 ref.

Descriptors: *Overland flow, *Turbulent flow, *Hydrographs, Analytical techniques, Hydraulics, Mathematics, Methodology, Laminar flow, Equations, Flow, *Horton's equation, Equilibrium time, Transitional flows.

In the differential equation of the overland turbulent flow which was first postulated by Horton, the value of c equals 5/3. For this value of c, the flow equation could not be integrated algebraically. Horton solved the equation for c = 2 and believed that his solution was valid for mixed flow. The flow equation with c = 5/3 was solved algebraically herein. It was shown elsewhere that the flow equation indeed can be integrated for any rational value of c. (Singh-ISWS)
W78-06215

THE 1976 DROUGHT IN FRANCE: CLIMATOLOGICAL ASPECTS AND CONSEQUENCES (LA SECHERESSE 1976 EN FRANCE: ASPECTS LIMATOLOGIQUES ET CONSEQUENCES),
Direction de la Meteorologie, Boulogne-Billancourt (France).
For primary bibliographic entry see Field 2B.
W78-06221

LOW RIVER RUNOFF,
A. M. Vladimirov.
Soviet Hydrology, Selected Papers, Vol. 15, No. 2, p 138-141, 1976. 7 ref. Translated from Trudy IV Vsesoyuznogo Gidrologicheskogo S'yezda, Vol. 3, p 398-406, 1975.

Descriptors: *Low flow, *Rivers, *Runoff, *Groundwater, Base flow, Droughts, Foreign research, Water levels, Flow, Streamflow, River flow, Water supply, Water shortage, Subsurface waters, Subsurface runoff, Surface-groundwater relationships, Evaporation, Precipitation(Atmospheric), Hydrology, *USSR.

There are two main phases in the water regime of rivers: a high-flow (spring flood and flash flood) phase, and a low-flow phase. The latter is typical of periods with limited water inflow into rivers and can be observed in winter and the summer-autumn season. In those periods, river runoff is tens and even hundreds of times lower than during the spring flood and flash floods. Runoff in some rivers become depleted to the extent that the rivers dry out (in summer) or freeze solid (in winter). The duration of the low-flow period may vary from tens of days to 10-11 months, depending on climatic conditions and the size of the river. In that period, various branches of industry may experience a severe water shortage. Furthermore, in some regions the water shortage may be the only factor limiting the development of industry and economy. It is obvious, therefore, that sufficiently accurate informtion on river runoff during the low-flow period is sorely needed. Correct analysis of the conditions of runoff formation and development of sound recommendations for computations are impossible without a clear idea of the role of physiographic factors in river runoff formation. A combination of factors affects the conditions of formation of low runoff and its magnitude. This combination can be divided into two groups: climatic factors and underlying-surface factors. (Sims-ISWS)
W78-06227

HYDROGRAPH SYNTHESIS USING LANDSAT REMOTE SENSING AND THE SCS MODELS,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. M. Ragan, and T. J. Jackson.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-30632, Price codes: A04 in paper copy, A01 in microfiche.
Report No. NASA-TM-X-71175 or Preprint X-913-76-161, July 1976. 57 p, 14 fig, 15 tab, 12 ref.

Descriptors: *Satellites(Artificial), *Aerial photography, *Hydrographs, *Synthetic hydrology, Methodology, Urban runoff, Computers, Model studies, Soil types, *LANDSAT data.

The land cover requirements of the Soil Conservation Service (SCS) Model used for hydrograph synthesis in urban areas were modified to be LANDSAT compatible. The curve numbers obtained with these alternate land cover categories compared well with those obtained in published example problems using the conventional categories. Emergency spillway hydrographs and synthetic flood frequency flows computed for a 21.1 sq mi test area showed excellent agreement between the conventional aerial photo-based and the LANDSAT-based SCS approaches. (Singh-ISWS)
W78-06236

POTAMOLOGY INVESTIGATION, RELATIONSHIP BETWEEN CALCULATED HYDRAULIC PARAMETERS AND PHYSICAL FEATURES OF THE CHANNEL.
Water and Environment Consultants, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 8B.
W78-06237

POTAMOLOGY INVESTIGATION, A STUDY OF THE SHIFT IN THE STAGE-DISCHARGE RELATIONSHIP OF THE MISSOURI RIVER AT SIOUX CITY, IOWA.
Water and Environment Consultants, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 4A.
W78-06238

HISTORICAL STREAMFLOW SUMMARY, MANITOBA, TO 1976.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W78-06310

HISTORICAL STREAMFLOW SUMMARY, SASKATCHEWAN, TO 1976.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W78-06311

MAGNITUDE AND FREQUENCY OF FLOODS IN SOUTHERN ONTARIO,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
B. P. Sangal, and R. W. Kallio.
Technical Bulletin Series No. 99, 1977. 336 p, 171 fig, 13 tab, 77 ref.

Descriptors: *Flood data, *Flood forecasting, *Flood frequency, Flow average, Flow measurement, Drainage, Drainage water, *Canada, *Flood frequency regions, *Ontario, Canadian Shield, St. Lawrence lowlands, Saugeen-Nottawasaga system, Maitland-Thames-Grand systems, Lake St. Clair, Niagara Peninsula, Lake Ontario, Trent-Severn system.

Flood frequency analyses for southern Ontario rivers have been performed using five theoretical frequency distributions: the extreme value type I

or Gumbel, Pearson type III, log-Pearson type III, log-normal and the three-parameter log-normal. A total of 129 gauging stations with 10 to 58 years of recorded maximum mean daily flows have been used. The Fuller formula, and a modification of the formula, have been found applicable for the estimation of the average and maximum ratios of the instantaneous peak flow to the mean daily flow. A regional flood frequency analysis has been carried out. Southern Ontario has been divided into nine hydrologic regions with roughly similar soils and physiographic characteristics. For each region, a graphical relationship between the mean annual flood and drainage areas was determined. The use of the ratio of the mean annual flood to mean annual runoff was investigated to determine if an additional parameter, mean annual runoff, had an effect on the mean annual flood in the study area. Dimensionless frequency curves based on the three-parameter log-normal distribution were derived for each region, giving the ratio of flood estimate to the mean annual flood for selected probabilities. (WATDOC)
W78-06312

BUOYANCY EFFECTS IN THERMALLY STRATIFIED OPEN-CHANNEL FLOW,
Iowa Univ., Iowa City. Dept. of Mechanics and Hydraulics.
For primary bibliographic entry see Field 8B.
W78-06371

URBANIZATION: HYDROLOGIC-HYDRAULIC-DAMAGE EFFECTS,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 4C.
W78-06385

PARALLEL CASCADES MODEL FOR URBAN WATERSHEDS,
Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Civil Engineering.
For primary bibliographic entry see Field 4D.
W78-06386

FLASH FLOOD FORMATION IN PERMAFROST REGIONS,
For primary bibliographic entry see Field 2C.
W78-06402

METHODS FOR REFINING SAMPLE ESTIMATES OF THE PARAMETERS OF HYDROLOGIC SERIES,
V. V. Aturin, V. V. Zubarev, and C. G. Kostina.
Soviet Hydrology, Selected papers, Vol 15, No 2, p 123-126, 1976. 2 tab, 8 ref. Translated from Trudy IV Vsesoyuznogo Gidrologicheskogo S'yezda, Vol 3, p 192-200, 1975.

Descriptors: *Hydrologic data, *Data processing, *Estimating equations, Mathematics, Equations, Runoff, Rivers, Annual, Statistics, Markov processes, Monte Carlo method, Analytical techniques, Mathematical models, Hydrology, Hydrologic series, Hydrologic parameters.

Some ways of refining sample estimates of the parameters of the probability distribution of annual river runoff were examined by comparison with the values obtained by methods developed at the present time. The following parameters, characterizing (along with the type of distribution curve and the correlation apparatus) the patterns of annual runoff fluctuations, were refined: the coefficient of variations, the ratio of the coefficient between the runoff of successive years (with approximation of the physical process in question by a simple Markov chain). Three ways were considered of refining sample estimates of the parameters of annual runoff series: (1) experimentally, on the basis of investigations of the distributions of instantaneous estimates of the parameters from samples of artificial hydrologic series simulated by the Nonte Carlo method; (2) on the basis of the method of maximum likelihood by allowing for connectedness within the series; and (3) using Bayes' approach to estimating the parameters of time series. It was found that the methods for estimating the parameters of runoff series, developed in hydrology, do not exhaust the possibilities of modern mathematics. The accuracy of the estimates can be improved by continuing the investigations described here. Their effectiveness will determine future computations. The investigations described were performed in application to annual runoff fluctuations. However, they can be used also to study runoff fluctuations over smaller time intervals. (Sims-ISWS)
W78-06403

REGIONAL WORKING FORMULA OF MAXIMUM RUNOFF IN THE SYRIAN ARAB REPUBLIC,
For primary bibliographic entry see Field 4A.
W78-06404

PROBLEMS ASSOCIATED WITH MAINTENANCE OF CHANNEL CAPACITY BELOW FEDERAL RESERVOIRS IN KANSAS,
Kansas Water Resources Research Inst., Manhattan.
T. Huang, and E. C. Pogge.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 560, Price codes: A06 in paper copy, A01 in microfiche. Contribution No. 195, February 1978. 108 p, 39 fig, 4 tab, 36 ref, 2 append. OWRT A-075-KAN(1), 14-34-0001-6017.

Descriptors: *Morphology(Channel), *Stream erosion, *Alternation of flow, Degradation(Stream), *Channel flow, Alluvial channels, Reservoir operation, Model studies, *Kansas, Wakarusa River(Kan), Fluvial sediments, Clinton Dam(Kan), *Channel capacity, *Reservoir regulated flow, *Channel geometry.

Changes in channel geometry and channel capacity resulting from the construction of large impoundment structures on alluvial streams are examined. The theories and concepts of fluvial morphology and free-surface flow are utilized to develop conceptual models relating to the changes and trends of changes resulting when the natural flow regime of a stream is altered through the construction and operation of a large reservoir. A series of case studies for stream reaches below existing reservoirs are performed utilizing the limited amount of data that was available. Results of the case studies support conclusions derived from the conceptual models. A channel degradation model is developed and tested on the Wakarusa River below Clinton Dam near Lawrence, Kansas. Although the results are not conclusive, they indicate consistent trends which are in agreement with those predicted by theoretical analysis. A series of channel cross-sections on the Wakarusa River have been established, monumented and surveyed. These will be periodically resurveyed to provide more consistent data on actual channel changes occurring below Clinton Dam.
W78-06580

TIME-OF-TRAVEL AND DYE-DISPERSION STUDIES OF SELECTED STREAMS AND LAKES IN THE OSWEGO RIVER BASIN, NEW YORK, 1967-75,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06589

TECHNIQUE FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS IN TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06591

APPLICATION OF A RAINFALL-RUNOFF MODEL IN ESTIMATING FLOOD PEAKS FOR SELECTED SMALL NATURAL DRAINAGE BASINS IN TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06602

WATER RESOURCES ALONG THE TAPS ROUTE, ALASKA, 1970-74,
Geological Survey, Anchorage, AK. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06603

HYDROLOGIC DATA FOR LITTLE ELM CREEK TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06604

2F. Groundwater

DETERMINATION OF UNCONFINED AQUIFER PARAMETERS USING PARTIALLY PENETRATING WELLS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soil and Water Engineering.
S. K. Sondhi, and S. R. Singh.
Journal of Hydrology, Vol 36, No 3/4, p 225-231, February 1978. 2 fig, 2 tab, 17 ref.

Descriptors: *Water table aquifers, *Aquifer characteristics, *Hydraulic properties, *Wells, *Penetration, *Mathematical models, Model studies, Curves, Equations, Dupuit-Forchheimer theory, Groundwater movement, Pumping, *Partially penetrating wells, *Effective penetration, Sand tank models.

An analytical solution was developed to determine unconfined aquifer parameters by conducting pump tests on partially penetrating wells. The aquifer was assumed to be homogeneous, isotropic, and infite in areal extent. A new concept of 'effective penetration' was introduced. A dimensionless curve was developed to find the effective penetration of the well. A circular sand tank model was used to check the applicability of the relationships developed. (Visocky-ISWS)
W78-06209

ANALYTIC SOLUTIONS FOR DRAWDOWNS IN WEDGE-SHAPED ARTESIAN AQUIFERS,
Birmingham Univ. (England). Dept. of Mechanical Engineering.
Y. K. Chan, N. Mullineux, J. R. Reed, and G. G. Wells.
Journal of Hydrology, Vol 36, No 3/4, p 233-246, February 1978. 7 fig, 6 ref, 3 append.

Descriptors: *Drawdown, *Artesian aquifers, *Mathematical models, *Equations, Wells, Pumping, Boundaries(Surfaces), Homogeneity, Equations, Model studies, *Wedge-shaped aquifers.

Analytical solutions for the drawdowns due to a single well pumping at a constant rate from homogeneous artesian aquifers, whose plan view is wedge-shaped, were derived both for infinite and finite wedges under a variety of boundary conditions and for general angle. The influence of the bounding arc in the finite wedge was examined. The methods can be used in wedges in which the traditional method of images is not applicable. (Visocky-ISWS)
W78-06210

MEASUREMENT OF VERTICAL RECHARGE TO GROUNDWATER IN HARYANA STATE (INDIA) USING TRITIUM TRACER,
Indian Inst. of Tech., Kanpur. Dept. of Chemistry.
P. S. Goel, P. S. Datta, and B. S. Tanwar.
Nordic Hydrology, Vol 8, No 4, p 211-224, 1977. 10 fig, 4 tab, 10 ref.

Descriptors: *Groundwater recharge, *Measurement, *Tritium, *Tracers, *Soil water movement, Unsaturated flow, Aquifers, Recharge, Radioisotopes, Rainfall, Monsoons, Irrigation, Sampling, Foreign countries, Foreign research, *India, Piston-type flow.

Downward movement of soil moisture due to rainfall and supplemental irrigation in the unsaturated zone has been followed by tagging a layer of soil with tritiated water at a number of sites in the state of Haryana. The activity apparently moves by a piston type flow. The average recharge for 15 sites during the interval July-November, 1973, has been equivalent to 9 cm of water which is 14% of the irrigation plus rainfall. For 18 sites sampled after two monsoons (July 1973 to December 1974) the average recharge is 19 cm and the fractional recharge is 0.15. Wide variations in recharge values are noted. The most significant factor affecting the fractional recharge is the clay content of the soil. (Visocky-ISWS)
W78-06212

GROUNDWATER RECHARGE IN PANJAB-STATE (INDIA) USING TRITIUM TRACER,
Indian Inst. of Tech., Kanpur. Dept. of Chemistry.
P. S. Datta, and P. S. Goel.
Nordic Hydrology, Vol 8, No 4, p 225-236, 1977. 10 fig, 3 tab, 7 ref.

Descriptors: *Groundwater recharge, *Measurement, *Tritium, *Tracers, Aquifers, Recharge, Radioisotopes, Rainfall, Monsoons, Irrigation, Sampling, Water table, Foreign countries, Foreign research, *India.

Vertical recharge to groundwater due to the 1972 monsoon plus supplemental irrigation was measured at 21 sites in the state of Panjab (India) using tritium tracer. Average recharge was found to be equivalent to 8.5 cm of water. This is about 18% of the average rainfall and 12% of the total watering. (Visocky-ISWS)
W78-06213

MICROWAVE INTERFERENCE DETECTION OF SUBSURFACE WATER,
Drexel Univ., Philadelphia, PA. Dept. of Civil Engineering.
T. A. Okrasinski, A. E. Lord, Jr., and R. M. Koerner.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 104, No. GT1, p 119-124, January 1978. 2 fig, 1 tab, 7 ref, 1 append. EPA R-804763010.

Descriptors: *Microwaves, *Radio interference, *Groundwater, *Water table, Laboratory tests, Radar, Radio waves, Subsurface waters, Measurement, Equipment, Instrumentation, Hydrology.

A series of laboratory tests was presented. The tests confirmed the feasibility and indicated the accuracy of using microwave interference patterns to locate the depth from the ground surface to a water surface. Using existing microwave technology (which is well advanced) and equipment (which reasonably priced and commercially available), it appears that this technique can be applied to problems of concern to the geotechnical engineer. Such problems as water table location, phreatic surface location, and seepage from earth dams, from behind retaining walls and into excavations are examples that appear to be suitable candidates for use of the microwave technique. (Sims-ISWS)
W78-06225

LOW RIVER RUNOFF,
For primary bibliographic entry see Field 2E.
W78-06227

GROUND WATER RECHARGE TO THE AQUIFERS OF NORTHERN SAN LUIS VALLEY, COLORADO: A REMOTE SENSING INVESTIGATION,
Colorado School of Mines, Golden, Dept. of Geology.
D. Huntley.
Available from the National Technical Information Service, Springfield, VA 22161 as E77-10149, Price codes: A19 in paper copy, A01 in microfiche. Remote Sensing Report 76-3, (NASA-CR-152649), December 1976. 298 p, 98 fig, 5 tab, 111 ref, 6 append. NASA NGL 06-001-015.

Descriptors: *Groundwater, *Remote sensing, *Hydrogeology, *Groundwater basins, *Geohydrologic units, *Groundwater recharge, *Colorado, Aerial photography, Soil types, Vegetation, Regional analysis, Water resources, *San Luis Valley(Colo), Infrared photography, Thermal sensing, Resource evaluation.

The northern San Luis Basin can be divided into three distinct but hydrologically connected provinces. Faults are important in all regions: providing areas of increased permeability or acting as groundwater barriers. Use of aerial photography and thermal-infrared imagery resulted in a significant savings in time and increase in accuracy in this regional groundwater supply. Reflectance measurements showed that absolute reflectance differences in one part of the spectrum can be extrapolated to the rest of the photographic spectrum. Spectral variations related to vegetation variation, in turn related primarily to water availability, are extremely important in hydrogeologic studies. Both vegetation and saline soils can be used to distinguish between shallow and deep groundwater, but saline soil distribution is a more dependable indicator in San Luis Valley. Temperature differences seen on thermal-infrared imagery can be related to differences in thermal inertia, solar reflectance, evaporation rates, or subsurface temperature distribution. Both evaporative cooling and temperature effects due to varying groundwater depth affect the diurnal temperature curve in the same manner and are indistinguishable. (Adams-ISWS)
W78-06242

HYDRAULIC FRACTURING OF DRILLED WATER WELLS IN CRYSTALLINE ROCKS OF NEW HAMPSHIRE,
New Hampshire Dept. of Resources and Economic Development, Concord. State Geologists Office.
For primary bibliographic entry see Field 4B.
W78-06372

ENVIRONMENTAL ISOTOPIC STUDY OF THE CAMPI FLEGREI (NAPLES, ITALY) GEOTHERMAL FIELD,
Comitato Nazionale per le Ricerche Nucleari, Pisa (Italy). Lab. di Geologia Nucleare.
For primary bibliographic entry see Field 2K.
W78-06387

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1976 TO SPRING 1977,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06583

MAP SHOWING GROUND-WATER CONDITIONS IN THE LOWER VERDE RIVER AREA, MARICOPA, YAVAPAI, AND GILA COUNTIES, ARIZONA-1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06585

THE CLINTON STREET-BALLPARK AQUIFER IN BINGHAMTON AND JOHNSON CITY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06587

APPRAISAL OF THE WATER RESOURCES OF DEATH VALLEY, CALIFORNIA-NEVADA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06593

GROUND-WATER DATA FOR MICHIGAN, 1976,
Geological Survey, Lansing, MI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06598

EFFECTIVENESS OF PILOT CONNECTOR WELL IN ARTIFICIAL RECHARGE OF THE FLORIDAN AQUIFER, WESTERN ORANGE COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06599

DIGITAL-MODEL EVALUATION OF THE GROUND-WATER RESOURCES IN THE OCOTILLO-COYOTE WELLS BASIN, IMPERIAL COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. A. Skrivan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 533, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-30, November 1977. 50 p, 17 fig, 2 tab, 14 ref.

Descriptors: *Mathematical models, *Groundwater resources, *Arid lands, *California, *Hydrogeology, Aquifer characteristics, Pumping, Water yield, Water supply, Water demand, Drawdown, Groundwater recharge, Projections, Finite element analysis, *Imperial County(Calif), *Ocotillo.

A flow model using finite-element techniques has been constructed for an alluvial aquifer in the Ocotillo-Coyote Wells Basin, Imperial County, Calif. Natural recharge is about 2,600 acre-feet per year, and estimated ground water in storage is 640,000 acre-feet. Pumpage totaled 880 acre-feet in 1975. The computed decline from steady-state conditions in 1925 to December 1975 was 15 feet in Ocotillo. The projected decline from 1976 to 1995 with annual pumpage of 1,000 acre-feet is 6 feet and with annual pumpage of 2,000 acre-feet is 17 feet in Ocotillo. In the latter projection, continued pumping after 1995 may cause saline water to flow toward the potable ground water in and around Ocotillo. (Woodard-USGS)
W78-06600

DIGITAL COMPUTER SIMULATION MODEL OF THE ENGLISHTOWN AQUIFER IN THE NORTHERN COASTAL PLAIN OF NEW JERSEY,
Geological Survey, Trenton, NJ. Water Resources Div.
W. D. Nichols.

Geological Survey Water-Resources Investigations 77-73 (open-file report), 1977. 101 p, 31 fig, 7 tab, 59 ref.

Descriptors: *Groundwater resources, *Model studies, *Hydrogeology, *Aquifer characteristics, *Computer models, New Jersey, Water supply, Pumping, Drawdown, Water yield, Groundwater recharge, Hydrologic properties, Leakage, Transmissivity, Groundwater movement, Simulation analysis, Evaluation, *Englishtown aquifer(NJ).

Continued decline of water levels in the Englishtown aquifer, in New Jersey, has caused considerable concern regarding the ability of the aquifer to meet future yield demands. A detailed study of the capability of the aquifer to yield water entailed the use of a digital computer simulation model to evaluate aquifer and confining layer coefficients and to test alternative concepts of the hydrodynamics of the flow system. The modeled area includes about 750 square miles of the northern Coastal Plain of New Jersey and encompasses all the major centers of pumping from the Englishtown aquifer. The simulation model was calibrated by matching computed declines with historical water-level declines over the 12-year period, 1959-70. The volume of transient and steady leakage into the Englishtown aquifer from and through the adjacent confining layers equaled more than 90 percent of the total volume of water withdrawn from the aquifer between 1959 and 1970. The analytical estimate of transient leakage indicates that about 60 percent of the water withdrawn from the Englishtown between 1959 and 1970 was replaced by water released from storage in the adjacent confining beds. An additional 34 percent of the withdrawal over this time period was supported by steady leakage through the overlying confining bed from the Mount Laurel aquifer. Of the more than 30 billion gallons withdrawn from the aquifer over the 12-year period, about 2 billion gallons were obtained from storage in the aquifer. The values of aquifer and confining-layer coefficients used in the model are nearly the same as the average values obtained from field and laboratory data. (Woodard-USGS)
W78-06601

APPRAISAL OF GROUND-WATER CONDITIONS IN MERCED, CALIFORNIA, AND VICINITY,
Geological Survey, Menlo Park, CA. Water Resources Div.
R. W. Page.
Open-file report 77-454, December 1977. 43 p, 12 fig, 5 plates, 11 tab, 26 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Water quality, *Water yield, *California, Pumping, Water level fluctuations, Groundwater movement, Groundwater recharge, Water wells, Water supply, Evaluation, Hydrologic data, Maps, Chemical analysis, *Merced area(Calif).

Merced is in the northeastern part of the San Joaquin Valley, California. The fresh-groundwater basin is about 1,200 feet thick. Five aquifers are defined in the Merced area: (1) The Mehrten Formation (Miocene and Pliocene), (2) a confined aquifer, (3) an intermediate aquifer, (4) a shallow aquifer, and (5) a probable unconfined aquifer. Ground water moves generally westward or southwestward. Recharge to the aquifers is from ground-water flow, leakage, and irrigation water. Discharge is by seepage, evaporation, transpiration, and pumping. Fluctuations in water level vary from place to place. The chemical quality of ground water is good and is generally a bicarbonate-type water. (Woodard-USGS)
W78-06606

GROUND WATER DIFFERENCES ON PINE AND HARDWOOD FORESTS OF THE UDELL EXPERIMENTAL FOREST IN MICHIGAN,
North Central Forest Experiment Station, St. Paul, MN.
D. H. Urie.
U.S. Department of Agriculture, Forest Service, Research Paper NC-145, 14 p. 1977. 8 fig, 10 ref, 2 tab.

Descriptors: *Groundwater recharge, *Deciduous forests, *Coniferous forests, *Michigan, Pine trees, Hydrologic budget, Water table, Sands, Water yield, Watersheds(Basins), Groundwater, Natural recharge.

Groundwater recharge under hardwood and pine forests was measured from 1962 to 1971 on the Udell Experimental Forest in Michigan. Hardwood forests produced more net groundwater than pine forests by an average of 50 and 100 mm/yr, using two methods of analysis. Shallow water-table lands yield 80 to 100 mm/yr less water than deep well-drained sands. Water yield decreased the most between drainage classifications of pine plantations. (Witt-IPC)
W78-06640

2G. Water In Soils

MEASUREMENT OF VERTICAL RECHARGE TO GROUNDWATER IN HARYANA STATE (INDIA) USING TRITIUM TRACER,
Indian Inst. of Tech., Kanpur. Dept. of Chemistry.
For primary bibliographic entry see Field 2F.
W78-06212

GROUNDWATER RECHARGE IN PANJAB-STATE (INDIA) USING TRITIUM TRACER,
Indian Inst. of Tech., Kanpur. Dept. of Chemistry.
For primary bibliographic entry see Field 2F.
W78-06213

A MONTHLY WATER BALANCE MODEL INCLUDING DEEP INFILTRATION AND CANAL LOSSES,
Vrije Univ., Brussels (Belgium). Lab. of Hydrology.
For primary bibliographic entry see Field 2A.
W78-06220

SALT EFFECTS ON THE HYDRAULIC PROPERTIES OF A SWELLING SOIL,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
J. H. Dane, and A. Klute.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1043-1049, November-December 1977. 10 fig, 1 tab, 24 ref.

Descriptors: *Soils, *Soil physical properties, Hydraulic properties, *Hydraulic conductivity, *Salts, Electrolytes, Salinity, Instrumentation, Hydraulic gradient, Tensiometers, Pressure head, Loads(Forces), *Sodium adsorption ratio, Water retention, Swelling soil.

The effects of soil solution composition on the hydraulic conductivity, K, and the volumetric soil solution content, theta, were measured with mixed NaCl-CaC12 solutions. The total electrolyte concentration, C, and the sodium adsorption ratio, SAR, characterized the applied solutions. Steady-state flow cells were constructed with provision for (1) measurement of the volumetric flux of the solution phase during saturated and unsaturated flow conditions, (2) measurement of the volumetric soli solution content by gamma attenuation, (3) tensiometers for hydraulic gradient and pressure head, h, measurement, (4) application of an external load on the soil, and (5) measurement of bulk volume changes. Soil samples were subjected to sequences of solutions varying in C from 1,000 meq/liter to 10 meq/liter at constant SAR values of 0, 5, 15, 25, and 40, respectively. Hydraulic conductivity decreases occurred during the first sequence of decreasing C at fixed SAR values equal to or greater than 5. The higher the SAR value, the greater the decrease in K with decreasing C. The K decreases occurred at all volumetric soil solution contents within the range of experimental data. Increases in theta, at given h values, and decreases in bulk density (pb), occurred simultaneously with the decrease in K. Greater changes in K and theta, and smaller changes in pb occurred in the soil subjected to a higher external load. The K and pb decreases and the theta increases were to a great extent irreversible, i.e., when C was increased subsequently at a fixed SAR value, K, pb, and theta did not regain their initial values. Substantial increases in K were obtained, however, if the soil was air dried, sieved, and repacked into the flow cell. (Visocky-ISWS)
W78-06222

AN EVALUATION OF SEVERAL METHODS OF ESTIMATING SOIL VOLUME CHANGE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
J. C. Parker, D. F. Amos, and D. L. Kaster.
Soil Science Society of America Journal Vol. 41, No. 6, p 1059-1064, November-December 1977. 4 tab, 38 ref.

Descriptors: *Soils, *Volume, *Plasticity index, *Soil properties, Soil tests, Clays, Moisture content, Shrinkage, Hygroscopic water, Regression analysis, Statistical methods, *Soil volume, *Swell index, Activity index, Potential volume change, Sodium adsorption ratio.

The accuracy of several previously proposed methods of estimating potential soil volume change was evaluated using samples from the B2 horizons of three pedons of each of five soil series having various swelling characteristics. Models involving swell index, plasticity index, clay content, activity index, initial and final water contents, shrinkage limit, shrinkage ratio, liquid limit, linear shrinkage, and hygroscopic moisture content were evaluated by regression analysis with percent volume change of natural clods as the dependent variable. Most methods were found to be either too imprecise or too involved to be useful. The most practical correlations were with swell index (r aq = 0.92) and with plasticity index (r sq = 0.79). Estimates using these procedures should be used cautiously since their accuracy is only + or - 12 to 18% volume change, respectively, at the 95% confidence level. (Visocky-ISWS)
W78-06223

SURVIVAL AND MOVEMENT OF FECAL INDICATOR BACTERIA IN SOIL UNDER CONDITIONS OF SATURATED FLOW,
Oregon State Univ., Corvallis. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W78-06224

CARBON AND NITROGEN TRANSFORMATIONS IN SOILS AMENDED WITH SEWAGE SLUDGE,
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 5E.
W78-06282

TRENCH INCORPORATION OF SEWAGE SLUDGE IN MARGINAL AGRICULTURAL LAND,
Agricultural Research Service, Beltsville, MD. Biological Waste Management Lab.
For primary bibliographic entry see Field 5B.
W78-06297

FACTORS CONDUCIVE TO THE CONTAMINATION OF SOIL WITH OPISTHORCHIS EGGS AND THEIR SURVIVAL IN THE ENVIRONMENT OF THE OB RIVER AREA (IN RUSSIAN),
All-Union Scientific Research Inst. of Medical Parasitology and Tropical Diseases, Moscow (USSR).
For primary bibliographic entry see Field 5B.
W78-06346

EFFECTS OF WATER ON SLOPE STABILITY,
Kentucky Bureau of Highways, Lexington. Div. of Research.
For primary bibliographic entry see Field 8D.
W78-06377

NEW METHOD INJECTS SLUDGE INTO SOIL.
For primary bibliographic entry see Field 5D.
W78-06453

VEGETATION MANIPULATION - A CASE STUDY OF THE PINYON-JUNIPER TYPE,
Utah State Univ., Logan. Coll. of Natural Resources.
For primary bibliographic entry see Field 2I.
W78-06526

AN EVALUATION OF THE POTENTIAL FOR USING DRAINAGE CONTROL TO REDUCE NITRATE LOSS FROM AGRICULTURAL FIELDS TO SURFACE WATERS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.
W78-06578

QUALITY OF PERCOLATE BELOW THE ROOT ZONE OF SELECTED VEGETABLES GROWN IN NORTHERN GUAM,
Guam Univ., Agana. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-06582

PEATLAND AND WATER IN THE NORTHERN LAKE STATES,
North Central Forest Experiment Station, St. Paul, MN.
For primary bibliographic entry see Field 4D.
W78-06639

GROUND WATER DIFFERENCES ON PINE AND HARDWOOD FORESTS OF THE UDELL EXPERIMENTAL FOREST IN MICHIGAN,
North Central Forest Experiment Station, St. Paul, MN.
For primary bibliographic entry see Field 2F.
W78-06640

MOISTURE DETECTION APPARATUS,
For primary bibliographic entry see Field 3F.
W78-06668

TRANSLOCATION OF LABELLED FERTILIZER NITROGEN IN SOIL COLUMNS, (IN GERMAN),
Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf. Inst. fuer Landwirtschaft; and Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf. Forschungzentrum.
E. Haunold, and J. Zvara.
Bodenkultur 26(3), p 221-232, 1975.

Descriptors: Ammonium, Drainage, *Fertilizers, Leaching, *Nitrates, *Nitrogen, Potassium, Soil, Sulfates, *Translocation, Water pollution, Soil water.

The translocation of labelled fertilizer N in soils was studied in a 2 yr trial. (15NH4)2SO4 and K15NO3 were applied at 150 and 300 kg/ha. The fertilizers were placed in autumn on top of soil columns, in the 1st yr as salt, in the 2nd yr, in solution. The columns 45 cm in length and 5 cm in diameter contained about 1 kg soil, taken from the area of Fuchsenbigl (Lower Austria) and were buried in the soil with only a 5 cm top part remaining above ground. Soil pH was 7.6. The following year at the end of June, the columns were taken out, cut into segments and analyzed. The drainage water was also analyzed. The water balance for the 1st yr with a total amount of precipitation of 393 mm was as follows: 17% was recovered in the form of drainage water, 30% was found in the soil and 53% was lost by evaporation. At the end of the 2nd yr, with a rainfall of 170 mm during the investigation period, these figures were 12, 56, and 32%, respectively. The total amount of N, found in the drainage water after NH4 application was equal in both years and not significantly different from the controls. When N was applied as NO3, a higher amount of total N was recovered in the drains. when fertilizer was given as NH4, the interchange rate with the soil N was 10 and 13%, with NO3 2%. When fertilizing with NH4 7.6 and 6.6% were leached out, 37.9 and 33.7% remained in the soil, 54.5 and 59.7% were lost as gaseous N. After NO3 application 29.6 and 22.6% were found in the drainage water; 18.1 and 16.7% remained in the soil, and 52.3 and 60.6% were lost. At the end of the 2nd yr 10.3 and 5.9% of the applied NH4 were recovered in the drainage water, 50.1 and 44.1% remained in the soil and 39.5 and 50.1% were lost. After NO3 application these figures were 47.3 and 43.3$, then 40.0 and 34.8% and the losses were 12.7 and 21.9%, respectively.--Copyright 1977, Biological Abstracts, Inc.
W78-06674

COMPOSITION OF DIFFERENT FRACTIONS OF SOIL SOLUTIONS (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Soil Science.
E. M. Samoilova, and V. A. Demkin.
Pochvovedenie 11, p 24-27, 1976.

Descriptors: *Cation exchange, Chemicals, Ions, *Lysimetric water, Pores, *Soil solutions, *Soil water.

Lysimetric water and the capillary soil solution removed by alcohol or a membrane press have either a different chemical composition or a different quantitative ion ratio. This phenomenon is due to cation exchange between liquid and solid soil phases proceeding differently in pores of different diameters.--Copyright 1977 Biological Abstracts, Inc.
W78-06676

2H. Lakes

EFFECTS OF BURROWING TUBIFICID WORMS ON THE EXCHANGE OF PHOSPHORUS BETWEEN LAKE SEDIMENTS AND OVERLYING WATER,
Maine Univ. at Orono. Dept. of Botany and Quaternary Studies.
For primary bibliographic entry see Field 5C.
W78-06202

CHIRONOMIDS (DIPTERA) FROM SEDIMENTS OF LAKE MARTIGNANO (LAZIO), (IN ITALIAN),
Rome Univ. (Italy). Ist. di Zoologia.
For primary bibliographic entry see Field 5B.
W78-06203

FACING THE LONGTERM: AN INQUIRY INTO OPPORTUNITIES TO IMPROVE THE CLIMATE FOR RESEARCH WITH REFERENCE TO LIMNOLOGY IN CANADA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 6E.
W78-06217

RIVER-INDUCED CURRENTS IN A FJORD LAKE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2A.
W78-06219

WAVE REFLECTION AND TRANSMISSION AT PERMEABLE BREAKWATERS,
Massachusetts Inst., of Tech. Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-06229

SATELLITE IMAGES OF LAKE ERIE ICE: JANUARY-MARCH 1975,
National Environmental Satellite Service, Washington, DC.
For primary bibliographic entry see Field 2C.
W78-06231

NITROGEN FIXATION IN LAKES OF THE LAKE WASHINGTON DRAINAGE BASIN,
Washington Univ., Seattle. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-06326

PROCEEDINGS, MISSISSIPPI WATER RESOURCES CONFERENCE, 1975.
Mississippi State Univ., Mississippi State. Water Resources Research Inst.
For primary bibliographic entry see Field 2J.
W78-06351

THE IMPACT OF URBAN STORMWATER ON THE WATER QUALITY STANDARDS OF A REGULATED RESERVOIR,
Tennessee Univ., Knoxville Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-06362

THE DYNAMICS OF STRATIFICATION AND OF STRATIFIED FLOW IN LARGE LAKES.
International Joint Commission-United States and Canada, Windsor (Ontario). Standing Committee on the Scientific Basis for Water Quality Criteria. Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, Standing Committee on Lake Dynamics. International Joint Commission, Windsor, Ontario, 1976. 199 p. A.E.P. Watson, Editor.

Descriptors: *Conferences, *Great Lakes, *Stratified flow, *Model studies, *Stratification, *Lake Superior, *Lake Ontario, *Lake Michigan, Lakes, Data collections, Water temperature, Internal waves, On-site investigations, Currents(Water), Upwelling, Mixing, Mathematical models, Thermocline, Laboratory tests, Withdrawal, Inflow, Water quality.

The workshop objective was to address problems relating to the dynamics of lake stratification and to interpret their significance in lakewide, vertical mixing processes. The later contribute to the release and distribution of nutrients and contaminants from sediments. Subject matter presented covered both field observations and analogous laboratory and computer simulation experiments, together with interpretation of results. Several modelling studies were reported. The basis of existing models used for predicting the lake phenomena was reviewed critically. Intrinsic

shortcomings of the models were discussed, and caveats were suggested for guidance in their application to lake management and the related decision-making process. (See W78-06389 thru W78-06399)
W78-06388

SOME OBSERVATIONS OF STRATIFIED FLOW IN LARGE, THERMALLY STRATIFIED LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
E. B. Bennett.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 2; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 15-24, 1976. 6 fig.

Descriptors: *Lake Superior, *Lake Huron, *Great Lakes, *Stratified flow, *Surveys, *Canada, On-site investigations, Currents(Water), Water temperature, Measurements, Stratification, On-site data collections, Hydrography, Lakes, Flow, *Georgian Bay(Canada).

As part of a comprehensive program of study of Lake Superior during 1973, time series records of current flow and water temperature were obtained at 16 predominantly nearshore locations over the period late May through the beginning of October. The recording current meters were placed at depths of 10 m (all moorings), 15 m (13 moorings), 25 m (3 moorings), and 60 m (1 mooring). Fortnightly means of current speed and temperature were calculated from the data from each meter, and then grand averages were estimated for each fortnightly interval and depth. The observations demonstrated a two-fold effect of stratification on current structure: first, there is no shear if there is no stratification; and second, when stratification is strong enough, flux of momentum to the hypolimnion is limited with the result that current becomes weaker there while continuing to increase in the upper layers. A second example of stratified flow was provided by a summary of the 1974 current meter obsevations in Main Channel, which links Lake Huron and Georgian Bay. The recorded currents generally were directed either into or out of Georgian Bay, and the pattern of net currents had both horizontal and vertical structure. (See also W78-06388) (Humphreys-ISWS)
W78-06389

SOME OBSERVATIONS ON FREELY PROPAGATING INTERNAL WAVES IN LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
F. M. Boyce.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 3; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission Windsor, Ontario, p 25-51, 1976. 13 fig, 6 ref.

Descriptors: *Internal waves, *Lake Ontario, *Surveys, *Water temperature, Lakes, On-site investigations, On-site data collections, Data collections, Currents(Water), Waves(Water), Movement, Measurement, Hydrography, Analysis, Temperature.

Measurements of the temperature structure of Lake Ontario were obtained with towed profiling equipment on a north-south transect of the lake during August 1972. Internal waves at three different spatial scales of encounter were detected; 10 km, 1000 m, and 100 m. The longest scale relates to basin-wide internal standing wave modes, while the two shorter scales are associated with freely propagating internal waves. The propagating waves were described via their signatures on the temperature records, and possible mechanism of generation were invoked. It was suggested that the presence of these waves can serve as indicators of physical processes such as large-scale shear flow, laterally unstable boundary currents, and active vertical entrainment of a stratified fluid into a turbulent mixed layer. (See also W78-06388) (Humphreys-ISWS)
W78-06390

ON BULK MODELS OF THERMAL STRUCTURE IN LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
P. F. Hamblin.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 5; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 55-66, 1976. 3 fig, 7 ref.

Descriptors: *Lakes, *Mixing, *Theoretical analysis, *Mathematical models, Analytical techniques, Water temperature, Velocity, Currents(Water), Equations, Analysis, Iced lakes, Thermocline.

It was shown that the bulk approach to the theory of the dynamics of thermal structure in lakes relies upon a number of basic assumptions on the nature of the underlying thermal and velocity structure. In particular, knowledge of the velocity structure in lakes is inadequate at present. Traditionally, only temperature profiles have been measured in lakes. It was argued that before further progress can be achieved in understanding the thermal structure in both the bulk theories and the mixing coefficient approach, which itself requires knowledge of the squared vertical shear through the Richardson number, detailed measurements of the velocity structure as close as possible to the surface will have to be made under a variety of environmental conditions. (See also W78-06388 and W76-03733) (Humphreys-ISWS)
W78-06391

EVOLUTION OF THE LAKE ONTARIO THERMOCLINE DURING IFYGL (INTERNATIONAL FIELD YEAR IN THE GREAT LAKES, 1972),
Michigan Univ., Ann Arbor.
A. W. Green.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 6; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 67-78, 1976. 4 fig, 11 ref.

Descriptors: *Lake Ontario, *Model studies, *Water temperature, *Great Lakes, *Estimating, Thermocline, Lakes, Temperature, On-site tests, Surveys, On-site investigations, Stratification, Thermal stratification.

It was shown that a one-dimensional bulk model gives a good representation of the lake-averaged structure of Lake Ontario. This type of model is of interest to two groups. First, biologists, particularly biological system modelers, can use the results from models to gain some insights about the depth-time variations of some aquatic populations which are influenced by the stratification over the lake as a whole. Second, an important by-product of the model is the estimation of long-term air-lake exchanges of sensible and latent heart, kinetic energy, and water vapor. The gathering of that information was one of the important objectives of the IFYGL study. This model is the first, about which author is aware, that gives estimates of the exchanges with time scales from diurnal to seasonal. (See also W78-06388) (Humphreys-ISWS)
W78-06392

SIMULATION OF THE VERTICAL THERMAL STRUCTURES OF LAKES UNDER TRANSIENT METEOROLOGICAL CONDITIONS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
D. R. F. Harleman, and K. A. Hurley.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 7; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 79-96, 1976. 12 fig, 8 ref.

Descriptors: *Model studies, Water temperature, *Lakes, *Mathematical models, *Laboratory tests, On-site data collections, Theoretical analysis, Analytical techniques, Analysis, Forecasting, Movement, Thermal properties, Thermocline, Equations, Flow, Flow rates, Withdrawal, Reservoirs, Diffusivity, Spatial distribution, Thermal pollution, Heat transport.

The objective was to investigate the sensitivity of the vertical temperature structure of a lake to various parameters under transient meteorological conditions. The model is one-dimensional in the vertical direction; thus, the lake is assumed to be horizontally stratified. The influences of large-scale internal wave motions, waste heat discharges, and coastal boundary layers were not considered. The Ryan and Harleman model, used in the sensitivity studies, is a time dependent, one-dimensional, variable area model based on the absorption and transmission of solar radiation, advection due to inflows and outflows, and convection due to surface cooling. The validity of the basic heat transport model in the absence of wind turbulence and internal wave effects was demonstrated by carefully controlled laboratory experiments. On the model parameters examined, the least information is known about vertical diffusivity. More work needs to be done relating vertical diffusivity to such things as wind effects. (See also W78-06388) (Humphreys-ISWS)
W78-06393

NOTES ON RECENT RESEARCH ON SIMULATION OF TWO-DIMENSIONAL STRATIFIED FLOWS,
Resource Management Associates, Lafayette, CA.
G. T. Orlob.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 9; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 109-124, 1976. 8 fig, 8 ref.

Descriptors: *Stratified flow, *Model studies, *Lakes, *Thermal stratification, Mathematical models, Theoretical analysis, Flow, Junctions, Rivers, Analytical techniques, Equations, Currents(Water), Density currents, Mixing, Heated water, Distribution patterns, Spatial distributions, Two-dimensional flow.

The brief comments presented were intended to summarize some recent efforts to develop and apply the finite element method to the problem of simulation of weakly stratified flows in two dimensions. The basic equations upon which the models were founded are the general Navier-Stokes equation, the continuity equation, and the advection-diffusion equation. The monentum equations were modified to include the effects of bottom and wind friction along the appropriate boundaries. Then the equations were transformed for solution by the finite element technique using the Galerkin method of weighted residuals. The techniques discussed are finding wide application in studies of lakes, reservoirs, and other complex water bodies, particularly those with irregular boundaries or in which hydrodynamics and water quality behavior are closely coupled. Systems that are driven by wind, tide, and Coriolis forces can be simulated,

and the effects of density stratification can be considered. There is a need, as yet unfulfilled, for a more rigorous functional representation of turbulent energy exchange. (See also W78-06388) (Humphreys-ISWS)
W78-06395

NEARSHORE PLUME AND CURRENT STUDIES IN EASTERN LAKE MICHIGAN,
Environmental Technical Assessments, Inc., Oak Brook, IL.
For primary bibliographic entry see Field 5B.
W78-06396

MIXED LAYER DYNAMICS IN SMALL AND MEDIUM SIZED LAKES,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
H. Stefan.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 11; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 143-159, 1976. 8 fig, 2 ref.

Descriptors: *Lakes, *Water temperature, *Stratification, *On-site investigations, *Model studies, *Great Lakes, On-site data collections, Spatial distribution, Temperature, Mixing, Profiles, Energy budget, Reservoirs, Surveys, Entrainment, Thermal stratification, Thermocline.

The temperature structure of lakes or reservoirs depends primarily on energy inputs at the water surface as well as inflows and outflows or withdrawals. The water temperature structure of a lake is very dynamic and constantly in response to changing weather conditions. Therefore, it is appropriate and necessary to use more than a conservation of mass principle. An energy equation using integral energy input at the water surface, i.e. energy in the form of heat and mechanical energy (mostly wind work), was used with good results on small and medium sized lakes. A brief account of this work was given. Measured and predicted water temperature profiles for Lake Calhoun were presented. The integral energy approach to the analysis and prediction of water temperature structures in lakes provided very encouraging preliminary results. Additional research on the mechanics, rates, and scales of vertical energy transfer is needed. For applications to the Great Lakes, horizontal energy flow must be considered jointly with vertical fluxes, which compounds the difficulties, but probably does not make them insurmountable. (See also W78-06388) (Humphreys-ISWS)
W78-06397

NOTE ON LABORATORY MODELING OF SEASONAL THERMOCLINE,
Delaware Univ., Newark, Coll. of Marine Studies.
J. Wu.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 12; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 161-166, 1976. 2 fig, 5 ref.

Descriptors: *Laboratory equipment, *Stratification, *Hydraulic models, Model studies, Laboratory tests, Wind, Methodology, Testing procedures, *Thermocline, Seasonal, Wind-wave tank.

Experimental apparatus, procedure, and results were described briefly. The experiment was conducted in a transparent wind-wave tank 20.5 cm wide and 232 cm long. A blower was installed at the upwind end of the tank and a wave absorber at the downwind end. The tank was covered for the first 190 cm to provide a 9.5 cm high wind tunnel over 28 cm deep water. Two layers of fluids were used, blue-colred freshwater lying over clear saltwater of various densities. the thickening of the blue layer along with the tilting of the density interface under a steady wind were photographed with a movie camera. The rate of entrainment (i.e., the rate of thickening of the upper layer) was found to be constant, and the rate of change of the potential energy of the mixing layer was found to be proportional to the rate of the work done by the wind. However, only a small fraction of the work done by the wind is used for interfacial mixing of developing a seasonal thermocline. In order to simulate more closely the oceanic conditions, a track-shaped wind-wave tank was constructed. Experiments are in progress to study the thermocline erosion and the generation of internal waves. (See also W78-06388) (Humphreys-ISWS)
W78-06398

CONCLUSIONS, RECOMMENDATIONS AND RESEARCH NEEDS,
International Joint Commission-United States and Canada, Windsor (Ontario). Secretariat.
A. E. P. Watson.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 14; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 187-189, 1976.

Descriptors: *Stratification, *Lakes, *Research and development, Stratified flow, Methodology, Water quality, Instrumentation, Hypolimnion, Hydrodynamic, Flow, Water, Waves(Water), Velocity, Currents, Coasts, Boundary layers, Sampling, Profiles, On-site investigations, *Research needs, Wind stress.

Conclusions reached by the participants were: 81) Stratified flows are significant in lakewide vertical mixing processes, but their role in the release and distribution of nutrients and contaminants from sediments requires definition and further study. (2) Definitions and allocations of mixing zones demand an understanding of the dynamics of the water body concerned since, within stratified layers, dispersal rates can vary over very wide ranges. (3) Vertical profile sampling techniques need to be developed. (4) The limitations of most predictive models for the behavior of aquatic systems and their environmental quality depend upon the validity of assumptions regarding flow processes. (5) Such water quality models should be used with discretion as aids in the decision-making process in the management of the Great Lakes. (See also W78-06388) (Humphreys-ISWS)
W78-06399

RESEARCH ON HYGIENIC CONDITIONS OF THE OLIVERI-TINDARI LAKE COMPLEX (MESSINA),
Messina Univ. (Italy). Inst. of Hygiene.
For primary bibliographic entry see Field 5A.
W78-06499

FUNDAMENTAL ANALYSIS OF THE LINEAR MULTIPLE REGRESSION TECHNIQUE FOR QUANTIFICATION OF WATER QUALITY PARAMETERS FROM REMOTE SENSING DATA,
Old Dominion Univ., Norfolk, VA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-06550

TIME-OF-TRAVEL AND DYE-DISPERSION STUDIES OF SELECTED STREAMS AND LAKES IN THE OSWEGO RIVER BASIN, NEW YORK, 1967-75,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06589

PHYTOPLANKTONIC ASSOCIATIONS OF SWEDISH LAKES,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-06683

SOME MESOTROPHIC PHYTOPLANKTON INDICATORS,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-06684

SOME LITTLE KNOWN SWEDISH PHYTOPLANKTERS,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-06685

ON THE VARIATION OF MICRASTERIAS MAHABULESHWARENSIS F. WALLICHII,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-06686

STAURASTRUM PLACTONICUM ANS ST. PINGUE: A STUDY OF PLANKTONIC EVOLUTION,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-06687

PHYTOPLANKTON OF LAKE SHIWA NGANDU,
K. Thomasson.
Hydrobiological Survey of the Lake Bangweulu, Luapula River Basin (Zambia), Vol. 4, fascicule 2, October 1966, Cercle Hydrobiologique de Bruxelles (Belgium). 91 p, 21 fig, 81 ref.

Descriptors: *Lake Shiwa Ngandu(Zambia), *Lake Young(Zambia), *Phytoplankton, *Floral lists, *Algae, Zambia, Africa, Desmids, Zooplankton, Lake Bangweulu(Zambia), Species composition, Lakes.

An annotated list of the phytoplankton of Lake Shiwa Ngandu (Lake Young), Zambia, is presented, with particular emphasis on desmids. Miscellaneous notes on zooplankton are also included. The study is part of a hydrobiological survey of the Lake Bangweulu-Luapula River Basin. Lake Shiwa Ngandu is located 110 km east of Lake Bangweulu at an altitude of about 1400 m, on the northwestern side of the crest of Congo-Luangwa. The lake is 5.5 km long by 1.1 km wide, with a maximum depth of about 10m; pH varies from 5.7-6.8. There is luxuriant macrophyte vegetation. No conspicuous differences were found in plankton composition between June and December samples. The bulk of the phytoplankton were made up of the same 20-30 species. The following species were abundant: Melosira granulata, Micrasterias radiata var. brasiliensis, M. radiosa var. elegantior, Staurastrum bourrellyianum, S. tenuibrachiatum, and a number of biradiate Staurastrum species. Somewhat less abundant were Melosira agassizii, various taxa of Staurastrum fuellebornii, S. johnsonii var. altius, S. wildemanii, Xanthidium brevinasutum, and Surirella tenera var. nervosa. Twenty-one plates of phytoplankton and zooplankton are included. (Lynch-Wisconsin)
W78-06688

SEASONAL DISTRIBUTION OF VITAMIN B12 IN LAKE KINNERET,
Kinneret Limnology Lab., Tiberias (Israel).
For primary bibliographic entry see Field 5C.
W78-06690

DISTRIBUTION OF MYXOBACTERS IN AQUATIC HABITATS OF AN ALKALINE BOG,
Central Michigan Univ., Mt. Pleasant. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-06691

MERCURY IN THE LAKE POWELL ECOSYSTEM,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W78-06694

COPEPOD 2: A MARKOV-TYPE MODEL FOR COPEPOD POPULATION DYNAMICS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 5C.
W78-06696

2I. Water In Plants

THE ADAPTIVE CHARACTERISTICS OF DESERT PLANTS,
Harvard Univ., Cambridge. Dept. of Biology.
O. T. Solbrig, and G. H. Orians.
American Scientist, Vol. 65, No. 4, p 412-421, July-August, 1977, 13 fig, 2 tab, 27 ref.

Descriptors: *Desert plants, *Plant growth, *Photosynthesis, Deserts, Arid lands, Semiarid climates, Cacti, Precipitation(Atmospheric), Rainfall, Mesquite, Carbon dioxide, Stomata, Water loss, Phreatophytes.

Although the physiological and anatomical similarity of plants in desert environments, regardless of phylogenetic relationship or geographical distribution, is a well established fact, the reasons for their similarity are less well understood. This study examines how the physical environment acts as a selective agent on plant form and function. First the desert environments are described and then an analysis of the costs and benefits of different photosynthetic mechanisms are presented. The conclusions are presented. The association between water loss and carbon dioxide gain through stomata and the water storage properties of desert soils are sufficient to explain the coexistence of annuals, succulents, and evergreen shrubs. (Jamail-Arizona)
W78-06337

INFLUENCE OF SOIL TYPE, PH, MOISTURE AND TEMPERATURE ON PHYTOTOXICITY AND EFFECTIVENESS OF THE FUNGICIDES OF THE PCNB AND TMTD GROUPS IN THE CONTROL OF ONION SMUT (UROCYSTIS MAGICA PASS.), (IN POLISH),
Szkola Glowna Gospodarstwa Wiejskiego Warsaw (Poland).
For primary bibliographic entry see Field 3F.
W78-06505

VEGETATION MANIPULATION - A CASE STUDY OF THE PINYON-JUNIPER TYPE,
Utah State Univ., Logan. Coll. of Natural Resources.
G. F. Gifford.
In: Watershed Management of Range and Forest Lands, March 1976. Proceedings, Fifth Workshop of the United States/Australia Rangelands Panel, Boise, Idaho, June 15 - 22, 1975, p 141-148. 2 tab, 41 ref. OWRT A-022-UTAH(2).

Descriptors: *Pinyon, Pine trees, *Juniper trees, *Revegetation, *Vegetation establishment, Planting management, Range management, Watershed management, Interception, Runoff, Grazing, Burning, Sediment discharge, Water quality, Wildlife, Forages, Economics, Moisture, Watershed impacts, Water budgets, Woodlands, Tree removal methods, Chaining, Forage production.

The environmental impact of conversion of pinyon-juniper woodland to a grass or grass-shrub combination is investigated; this practice is exemplary of common vegetation manipulation used throughout Nevada, Utah, Colorado, Arizona, and New Mexico. The hydrology of eliminating pinyon and juniper trees is discussed and several treatments are detailed. Studies on interception, soil moisture patterns, runoff, water budgets, water quality, and sediment discharge are briefly reviewed; impacting factors such as grazing, soil structure, debris burning, erosion, and chemical and biological properties are outlined. Probable watershed impacts associated with various techniques of tree removal are assessed; water use efficiencies of several replacement grass species are reported. The impact of vegetation manipulation on wildlife, forage production, and archaeological values is evaluated; economic considerations are addressed. (Seip-IPA)
W78-06526

THE MACROPHYTE VEGETATION OF THE DANUBE WATER-BODIES IN BULGARIA AND ITS CHANGE UNDER THE EFFECT OF HUMANS AND CONSERVATION, (IN RUSSIAN),
Bulgarian Academy of Sciences, Sofia. Inst. of Botany.
Kh. Kochev, and D. Iordanov.
Bot Zh (Leningr) 61(9), p 1294-1297, 1976.

Descriptors: *Water conservation, *Plant physiology, Azolla-filiculoides, *Bulgaria, *Danube River, Epilobium-palustris, Lakes, Leersia-oryzoides, *Macrophytes, Nymphaea-alba, Phragmites-communis, Sium-latifolium, Swamps, Thelypteris-palustris, *Vegetation, Water bodies.

The ever-diminishing lakes and swamps along the Bulgarian Danube are described and data is given on the distribution of macrophyte phytocenoses with a classification of formations and associations. The associations determined include Phragmites communis; P. communis-Azolla filiculoides; P. communis-Thelypteris palustris; P. communis-Leersia oryzoides; P. communis-Sium latifolium; P. communis-Nymphaea alba; and P. communis-Epilobium palustris. The basic changes in vegetation from the effects of human activity are described, and measures are recommended for preservation of disappearing, rare and relict plant species.--Copyright 1977, Biological Abstracts, Inc.
W78-06675

EFFECT OF CHLOROCHOLINE CHLORIDE ON THE RESISTANCE OF WHEAT TO AN EXCESS AND DEFICIENCY OF THE WATER SUPPLY DURING THE CRITICAL PERIOD (IN RUSSIAN),
Komsomolskii-na-Amure Gosudarstvennyi Pedagogical Inst. (USSR).
For primary bibliographic entry see Field 3C.
W78-06692

GAS CHROMATOGRAPHIC DETERMINATION OF RESIDUAL AMINE LEVELS IN PLANTS (IN RUSSIAN),
All-Union Research Inst. of Agricultural Use Sewage. Staraya Kupavan (USSR).
For primary bibliographic entry see Field 5A.
W78-06699

2J. Erosion and Sedimentation

EFFECTS OF BURROWING TUBIFICID WORMS ON THE EXCHANGE OF PHOSPHORUS BETWEEN LAKE SEDIMENTS AND OVERLYING WATER,
Maine Univ. at Orono. Dept. of Botany and Quaternary Studies.
For primary bibliographic entry see Field 5C.
W78-06202

SEASONAL AND ENVIRONMENTAL VARIATIONS IN SEDIMENT ACCRETION IN A LONG ISLAND SALT MARSH,
State Univ. of New York at Stony Brook. Dept. of Earth and Space Science.
For primary bibliographic entry see Field 2L.
W78-06226

EROSION AND SEDIMENT CONTROL AUDIOVISUAL TRAINING PROGRAM, WORKBOOK,
Hittman Associates, Inc., Columbia, MD. Environmental and Geosciences Dept.
For primary bibliographic entry see Field 4D.
W78-06228

INPUT DATA FORMATS FOR ALLUVIAL CHANNEL EXPERIMENTS,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 8B.
W78-06235

BEACH AND NEARSHORE PROCESSES IN SOUTHEASTERN FLORIDA,
Coastal Engineering Research Center, Fort Belvoir, VA; and Florida Ocean Sciences Inst. Inc., Deerfield Beach.
For primary bibliographic entry see Field 2L.
W78-06246

SPATIAL AND TEMPORAL CHANGES IN NEW JERSEY BEACHES,
Coastal Engineering Research Center, Fort Belvoir, VA.; and Tetra Tech, Inc., Pasadena, CA.
For primary bibliographic entry see Field 2L.
W78-06247

SEDIMENT BUDGET ANALYSIS WRIGHTSVILLE BEACH TO KURE BEACH, NC,
Army Engineer District, Wilmington, NC. Coastal Engineering Studies Section.
For primary bibliographic entry see Field 2L.
W78-06250

SEDIMENTS IMPOUNDED BY AN OFFSHORE BREAKWATER,
Coastal Engineering Research Center, Fort Belvior, VA.
For primary bibliographic entry see Field 2L.
W78-06251

VISUAL SURF OBSERVATIONS/MARINELAND EXPERIMENT,
Coastal Engineering Research Center, Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-06252

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY, APPENDIX F--CRYSTALLINE MATRIX,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W78-06256

EFFECTS OF GULLY PLUGS AND CONTOUR FURROWS ON EROSION AND SEDIMENTATION IN CISCO BASIN, UTAH,
Utah State Univ., Logan. Coll. of Natural Resources.
For primary bibliographic entry see Field 4D.
W78-06334

THE MARINE GEOLOGY AND SEDIMENTOLOGY OF HAWAII KAI, KUAPA POND, AND ADJACENT MAUNALUA BAY,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 2L.
W78-06345

PROCEEDINGS, MISSISSIPPI WATER RESOURCES CONFERENCE, 1975.
Mississippi State Univ., Mississippi State. Water Resources Research Inst.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 324, Price codes: A07 in paper copy, A01 in microfiche. April, 1975. 133 p, 74 fig, 17 tab, 45 ref. OWRT A-999-MISS(11).

Descriptors: *Water Resources Institute, *Mississippi, *Water resources, Water resources development, Conferences, *Conference report.

Proceedings of the tenth Mississippi Water Resources Conference are reported; nine out of the ten papers presented are reprinted including (1) 'Feasibility Report on Gulf Coast Deep Water Port Facilities;' (2) 'Recent Sedimentation Rates in the Lower Mississippi River Valey: Lake Verret-Lake Palourde, Louisiana'; (3) 'Environmental Considerations and Their Impact on Water Resource Development Projects'; (4) 'Suspended Sediment in Four North Mississippi Reservoirs'; (5) 'Commentary on Long Period Sea Waves that Move into Shallow Water'; (6) 'The Role of the Corps of Engineers in Coastal Zone Management Planning'; (7) 'Water Resources and the Mississippi Coastal Zone Management Program'; (8) 'Determination of Water Quality Within and Downstream of Bay Springs Lake'; and (9) 'Wastewater Stabilization Ponds and PL 92-500 Case Studies and Upgrading'. (Seip-IPA)
W78-06351

SOIL EROSION AND DUST CONTROL ON ARIZONA HIGHWAYS, PART II, LABORATORY TESTING PROGRAM,
Arizona Univ., Tucson. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4D.
W78-06524

SOIL EROSION AND DUST CONTROL ON ARIZONA HIGHWAYS, PART III, PROGRESS REPORT-FIELD TESTING PROGRAM,
Arizona Univ., Tucson. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4D.
W78-06525

BEACH NOURISHMENT TECHNIQUES. REPORT 2: A MEANS OF PREDICTING LITTORAL SEDIMENT TRANSPORT SEAWARD OF THE BREAKER ZONE,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 2L.
W78-06534

THE INTERTIDAL FAUNA OF SANDY BEACHES. A SURVEY OF THE SCOTTISH COAST,
Aberdeen (Scotland). Marine Lab.
For primary bibliographic entry see Field 2L.
W78-06535

WAVE CLIMATE AT SELECTED LOCATIONS ALONG U.S. COASTS,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-06548

PROBLEMS ASSOCIATED WITH MAINTENANCE OF CHANNEL CAPACITY BELOW FEDERAL RESERVOIRS IN KANSAS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 2E.
W78-06580

ELUTRIATION STUDY OF WILLAMETTE RIVER BOTTOM MATERIAL AND WILLAMETTE-COLUMBIA RIVER WATER,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 5C.
W78-06592

WATER EROSION,
Agricultural Research Service, Lafayette, IN.
For primary bibliographic entry see Field 4D.
W78-06679

NUTRIENT LOSS RESEARCH,
Agricultural Research Service, Columbia, MO.
For primary bibliographic entry see Field 4D.
W78-06689

2K. Chemical Processes

THE MARINE GEOLOGY AND SEDIMENTOLOGY OF HAWAII KAI, KUAPA POND, AND ADJACENT MAUNALUA BAY,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 2L.
W78-06345

THE URANIUM-SERIES RADIONUCLIDES AS TRACERS OF GEOCHEMICAL PROCESSES IN LONG ISLAND SOUND,
Yale Univ., New Haven, CT. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2L.
W78-06379

THE EFFECT OF DISSOLVED AIR AND NATURAL ISOTOPIC DISTRIBUTIONS ON THE DENSITY OF WATER,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
F. J. Millero, and R. T. Emmet.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 084, Price codes: A02 in paper copy, A01 in microfiche. Journal of Marine Research, Vol. 34, No. 1, p 15-24, February 23, 1976. 1 fig, 5 tab, 28 ref. N00014-75-C-0173 and GA-40532.

Descriptors: *Air entrainment, *Physical properties, *Density, *Isotope studies, *Water properties, Gases, Air, Temperature, Atmosphere, Properties, Sea water, Analytical techniques, Carbon dioxide, Argon, Nitrogen, Oxygen, *Density of water, *Dissolved air, *Isotopic distribution, *Dissolved gases in water, *Density measurements.

The effects of dissolved air and of natural isotopic distributions on the density of water have been determined at 1 atm by using a magnetic float densimeter. Dissolved gases were found to decrease the density by 3.0 + or - 2 x 10 to the minus 7th power g/cu cm at 4C. The apparent molal volumes of air were found to be nearly independent of saturation concentration and temperatures between 0 and 30C. The decrease in density to + or - 2 x 10 to the minus 7th power can be determined from, delta d = -0.0026Xc where c is the total concentration of air in moles/liter (O2, N2, Ar and CO2) over the saturation and temperature range of ocean waters. The dissolved air experimental results were found to be in good agreement with those determined from partial molal volume data for gases determined by other workers. The ion exchanged Miami water used in the density studies was found to be 0.000001 g/cu cm lower than distilled standard mean ocean water (SMOW) and Mediterranean deep water (MDW). (Henley-ISWS)
W78-06383

ENVIRONMENTAL ISOTOPIC STUDY OF THE CAMPI FLEGREI (NAPLES, ITALY) GEOTHERMAL FIELD,
Comitato Nazionale per le Ricerche Nucleari, Pisa (Italy). Lab. di Geologia Nucleare.
G. Cortecci, P. Noto, and C. Panichi.
Journal of Hydrology, Vol. 36, No. 1/2, p 143-159, January 1978. 9 fig, 4 tab, 21 ref.

Descriptors: *Geothermal studies, *Isotope studies, *Groundwater, Oxygen, Hydrogen, Tritium, Sulfates, Sampling, Chemical analysis, Meteoric water, Sea water, Mixing, Foreign countries, Springs, Foreign research, Spring water, Thermal springs, Water temperature, *Campi Flegrei(Italy), *Italy.

Presented are the isotopic analyses of water and dissolved sulfate (H, O, T and S isotopes) from several thermal springs emerging from the volcanic cover in the Campi Flegrei area, sampled both in 1971 and 1975. The H- and O-isotopic analyses showed variation values ranging from -30 to +12 parts per thousand and from -6.7 to 1.4 parts per thousand, respectively, relative to SMOW. These values and the positive relationships between the isotopic values and the chemical parameters, such as the Cl content, suggest that the analyzed spring waters ae formed by a mixing, in different proportions, of two components: a water of marine origin filling the volcanic cover and coming from the Tyrrhenian Sea, and a meteoric water. The S-isotope composition ranged from variation = +2.4 to +20.1 parts per thousand relative to the meteoritic troilite, as the sulfate in the water from the thermal spring formed by practically undiluted marine water shows O- and S-isotopic ratios of +9.1 and +19.4 parts per thousand, respectively; these values are close to those measured for the Tyrrhenian Sea sulfate. On the contrary, the thermal spring fed by meteoric water had a dissolved sulfate with a variation of 018 = +9.0 parts per thousand and variation of 34S = 3.4 parts per thousand, these being the mean values for those measured in 1971 and 1975. Large chemical and isotopic variations, with regard to sampling times, were observed in some manifestations as more negative isotopic contents of the dissolved sulfate and lower chloride and sulfate concentrations correspond to more negative water isotopic values, and vice versa. The chemical and sulfate-water isotopic geothermometers, in general, do not reflect the real situation in the system. Only the spring fed by marine water and unaffected by mixing phenomena shows consistent equilibrium temperatures at depth. (Sims-ISWS)
W78-06387

SURVEY OF TRACE METAL CONTENTS OF SUSPENDED MATTER IN THE ST. LAWRENCE ESTUARY AND SAGUENAY FJORD,
Quebec Univ., Rimouski. Inst. National de la Recherche Scientifique.
For primary bibliographic entry see Field 5A.
W78-06401

USING TOPOGRAPHIC CHARACTERISTICS TO PREDICT TOTAL SOLUTE CONCENTRATIONS IN STREAMS DRAINING SMALL FORESTED WATERSHEDS IN WESTERN MONTANA,
Montana Univ., Missoula.
G. T. Foggin, III, and L. K. Forcier.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 578, Price codes: A03 in paper copy, A01 in microfiche.

Montana University Joint Water Resources Research Center, Bozeman, Research Report No. 89, September 1977. 42 p, 7 fig, 2 tab, 23 ref, 2 append. OWRT A-095-MONT(1).

Descriptors: *Solutes, Suspended solids, Carbonates, *Topography, Drainage area, Regression analysis, *Solute concentrations(Streams), *Forest watersheds, Streamflow, Small watersheds, Geomorphology, Seasonal, Water chemistry, Estimating equations, Cations, *Montana, Calcium, Magnesium, Sodium, Potassium, Sulfates, Bicarbonates.

Fifty local headwater streams draining undisturbed forested basins underlain by quartzites and argillites of the Precambrian Belt Supergroup in Western Montana were sampled during the 1976 spring runoff period. Total solute concentration in these streams was determined to be primarily related to the composition of the basin's parent material and secondarily to its morphometric character. Seasonal variation in total solute concentration was related to the degree of dilution a stream experienced during the period of high discharge. Constants for total solute concentration and seasonal variation for the sample streams were predicted from regression equations in which the geologic and morphometric characteristics of the watersheds were independent variables. A strong relationship was found between the predicted and observed total solute concentration values for these streams during the sampling period.
W78-06407

THE IMPACT OF STREAM RECONSTRUCTION AND A GABION INSTALLATION ON THE BIOLOGY AND CHEMISTRY OF A TROUT STREAM,
Lehigh Univ., Bethlehem, PA. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-06410

APPRAISAL OF THE WATER RESOURCES OF DEATH VALLEY, CALIFORNIA-NEVADA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06593

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06605

COMPOSITION OF DIFFERENT FRACTIONS OF SOIL SOLUTIONS (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Soil Science.
For primary bibliographic entry see Field 2G.
W78-06676

THE FRESH AIR--CLEAN WATER EXCHANGE,
For primary bibliographic entry see Field 5G.
W78-06693

2L. Estuaries

CONCENTRATIONS OF NUTRIENTS AND CHLOROPHYLL ON A CROSS-CHANNEL TRANSECT IN JUAN DE FUCA STRAIT, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-06216

A SIMPLE THEORETICAL MODEL FOR THE FLOW OF AN ESTUARY ONTO A CONTINENTAL SHELF,
Woods Hole Oceanographic Institution, MA. Dept. of Physical Oceanography.
R. C. Beardsley, and J. Hart.
Journal of Geophysical Research, Vol 83, No C2, p 873-883, February 20, 1978. 17 fig, 10 ref.

Descriptors: *Estuaries, *Continental shelf, *Model studies, Theoretical analysis, Stratification, Steady flow, Oceanography, Equations, Mathematical models, Mathematical studies, Mathematics, Currents(Water).

A simple theoretical model was developed to describe the steady flow of an estuary onto an adjacent continental shelf. A two-layer density stratification was assumed for the shelf water. The fluid motion is driven by the positive (upper layer) and negative (lower layer) mass fluxes associated with a pair of point sources located at the mouth of the estuary. The dynamics are linear and include the effects of Coriolis acceleration, turbulent friction, and bottom topography. Analytic solutions for the one-layer, single-source problem were found for two special depth profiles. A boundary layer solution was found for the power law depth profile, and a global solution was found for the log law profile. Both solutions indicated that the far-field flow is concentrated asymmetrically toward the right-hand coast in the northern hemisphere, a consequence of the basic balance between topographic vortex stretching and bottom friction. This mechanism also applies when a constant alongshore current is present. In the two-layer case, the flow in the upper layer generally tends to be concentrated toward the left-hand coast, since the upper fluid feels (1) the interface and not the bottom topography, and (2) the interfacial drag exerted by the lower fluid toward the right-hand coast. A brief comparison was made between model predictions and observations for the Hudson and Chesapeake Bay estuaries. (Lee-ISWS)
W78-06218

SEASONAL AND ENVIRONMENTAL VARIATIONS IN SEDIMENT ACCRETION IN A LONG ISLAND SALT MARSH,
State Univ. of New York at Stony Brook. Dept. of Earth and Space Science.
G. A. Richard.
Estuaries, Vol. 1, No. 1, p 29-35, March 1978. 6 fig, 1 tab, 18 ref.

Descriptors: *Sedimentation, *New York, *Salt marshes, *Sedimentation rates, On-site investigations, On-site data collections, Coasts, Marshes, Mud flats, Vegetation, Vegetation effects, Tides, Tidal waters, Tidal effects, Tidal marshes, Sediments, Seasonal, Deposition(Sediments), Sedimentology, Estuaries, *Long Island Sound, Spartina alterniflora, *Flax Pond(NY).

Flax Pond is a small (0.5 sq km) salt marsh on the north shore of Long Island, New York. Two 1 sq m plots within each of the following environments were covered with a market layer of either brick dust or aluminum glitter: (1) bare mud flats; (2) areas newly colonized by Spartina alterniflora; and (3) high intertidal S. alterniflora peat surfaces. Monthly cores revealed the amount of sediment that accumulated since placement of the marker. Accretion rates from October, 1974 to February, 1976 were as follows: bare mud flats -20.5 to 45.5 mm/yr; recently vegetated mud flats -9.5 to 37.0 mm/yr; and high intertidal peat surfaces -2.0 to 4.25 mm/yr. Sedimentation rates decrease with increasing elevation because of the reduced tidal submergence time and decreased height of the overlying water column. In areas of low elevation, ice and storms cause either erosion or a reduced rate of accretion during the winter months. The average mud accretion rate over the past 173 years is 3.4 mm/yr. Differences between the short-term rate and the long-term rate indicate substantial annual variation in the accumulation of mud in salt marshes. Short-term rates of peat accretion are similar to long-term estimates, indicating that rates of peat accretion are relatively constant over long intervals. (Sims-ISWS)
W78-06226

WAVE REFLECTION AND TRANSMISSION AT PERMEABLE BREAKWATERS,
Massachusetts Inst., of Tech. Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-06229

NEARSHORE DISPOSAL: ONSHORE SEDIMENT TRANSPORT,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 5B.
W78-06243

IMPLICATIONS OF SUBMERGENCE FOR COASTAL ENGINEERS,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-06244

SEDIMENT HANDLING AND BEACH FILL DESIGN,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-06245

BEACH AND NEARSHORE PROCESSES IN SOUTHEASTERN FLORIDA,
Coastal Engineering Research Center, Fort Belvoir, VA; and Florida Ocean Sciences Inst. Inc., Deerfield Beach.
A. E. DeWall, and J. J. Richter.
Army Coastal Engineering Research Center Reprint 78-4, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 425-443, 10 fig, 3 tab, 12 ref.

Descriptors: *Sedimentation, *Erosion, *Sediment transport, Beaches, Water resources, Florida, Outer Continental Shelf, *Pollutant transport, Nearshore processes, Seasonal variations, Transfer processes.

A 4.5-year series of daily and weekly littoral environment observations and beach profile surveys was made at 3 localities in southeastern Florida. As a result of varying protection by the Bahamas Bank, the amount of wave energy reaching the shoreline decreases from north to south. The magnitude of beach changes decreased from north to south and was low compared to changes on more exposed beaches on the U.S. east coast. Contributing factors include the sheltering effect of the Bahamas Banks, the lack of significant storms, and the underlying coquina limestone which characteristically crops out just below the MSL shoreline at the two sites with the highest waves, forming a protective reef that effectively retards beach erosion. (Sinha-OEIS)
W78-06246

SPATIAL AND TEMPORAL CHANGES IN NEW JERSEY BEACHES,
Coastal Engineering Research Center, Fort Belvoir, VA.; and Tetra Tech, Inc., Pasadena, CA.
C. H. Everts, and M. T. Czerniak.
Army Coastal Engineering Research Center Reprint 78-9, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 444-459, 6 fig, 3 tab, 7 ref.

Descriptors: *Beaches, *Sediment transport, New Jersey, Water resources, Outer Continental Shelf, *Pollutant transport, Spatial variations, Temporal variations.

Sand volume changes above mean sea level (MSL) and shoreline position changes as MSL were obtained from 4400 beach profiles acquired over a 10-year period along three New Jersey barrier islands. The results provide insight into the behavioral characteristics of sandy ocean beaches. Storm changes were highly variable between islands, and between profile lines on the same island. Often changes on profile lines less than 0.8 km apart were opposite in sign, suggesting a closer profile line spacing is required to obtain an accurate picture of storm changes. On two islands a definite seasonal change was found when 10-year data were averaged. The maximum sand volume and most seaward shoreline position occurred in August and the least in the January-April period. A year-to-year comparison of surveys would be best using data collected from January through April because changes from month to month were least then. Large variations in beach changes were measured from one year to the next, and on one of the three islands 10-year data did not appear sufficient to establish a long term trend in beach behavior. (Sinha-OEIS)
W78-06247

EVALUATION OF A CONCRETE BUILDING BLOCK REVETMENT,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8F.
W78-06248

DESIGNING FOR BANK EROSION CONTROL WITH VEGETATION,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-06249

SEDIMENT BUDGET ANALYSIS WRIGHTSVILLE BEACH TO KURE BEACH, NC,
Army Engineer District, Wilmington, NC. Coastal Engineering Studies Section.
J. T. Jarrett.
Army Coastal Engineering Research Center Reprint 78-3, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 986-1005, 7 fig, 5 tab, 6 ref.

Descriptors: *Sediment transport, *Erosion, *Deposition, *North Carolina, Water resources, Outer Continental Shelf, Pollutant transport, Littoral transport.

Littoral transport rates and inlet bypassing quantities were estimated for a 19-mile (30.6 km) segment of the North Carolina Coast extending from Wrightsville Beach southward to Kure Beach, by adopting a sediment budget approach. The steps involved in the sediment budget analysis were: (1) an estimate of volumetric changes along the shorelines and in the inlets, (2) wave refraction analysis to determine the distribution of longshore wave energy flux along the shoreline and (3) a correlation of the volume changes with the computed longshore energy flux distribution. The base period used for this analysis was from 1966 to 1974. After the material transport rates were determined for this base period, an evaluation was made of the changes in shore processes resulting from man-induced alterations in the shoreline configuration. (Sinha-OEIS)
W78-06250

SEDIMENTS IMPOUNDED BY AN OFFSHORE BREAKWATER,
Coastal Engineering Research Center, Fort Belvior, VA.
R. O. Bruno, G. M. Watts, and C. G. Gable.
Army Coastal Engineering Research Center Reprint 78-8, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 1006-1025, 15 fig, 5 ref.

Descriptors: *Breakwaters, *Sediment transport, *Shore protection, California, Sedimentation, Water resources, *Outer Continental Shelf, Pollutant transport.

The breakwater and entrance jetties for the Channel Islands Harbor in California form a total littoral barrier to longshore sand transport. The sand impounded by these structures was monitored by repetitive bathymetric surveys and systematic surface sand sampling. This paper discusses patterns of sediment deposition behind an offshore breakwater. Data collected were studied to determine if the deposition observed agrees with that predicted prior to construction. Both the geometry and size distribution of the deposition sediment are examined. Three dimensional computer plots are used to illustrate filling patterns. Sediment size and sorting distribution which occur during filling are investigated. Analyzed data allows an evaluation of predicted verses actual filling patterns. Sediment distribution in the impoundment area was evaluated. (Sinha-OEIS)
W78-06251

VISUAL SURF OBSERVATIONS/MARINELAND EXPERIMENT,
Coastal Engineering Research Center, Belvoir, VA.
C. Schneider.
Army Coastal Engineering Research Center Reprint 78-1, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 1086-1099, 6 fig, 3 tab, 5 ref.

Descriptors: *Surf, *Winds, *Ocean waves, *Measurement, Florida, Water resources, Water temperature, *Outer Continental Shelf, *Pollutant transport, Nearshore processes, Sea surface temperature, Satellite imagery, Wave height, Environmental conditions, Ground truth, Littoral Environment Observation Program(LEO).

The experiment was designed to test instrumentation that will be used onboard the SEASAT-A satellite to be launched in 1978. This satellite is designed to provide all-weather global monitoring of sea-surface temperature, significant wave height and surface wind speed and direction. As a part of this larger SEASAT-A experiment, it was decided to obtain wave and nearshore current data collected in accordance with techniques developed under the Littoral Environment Observation Program (LEO). It was hoped that these visually obtained data could be compared with wave data obtained from both a wave rider and a seasled and that measurements obtained at one LEO site could be correlated with observations taken at similar nearby sites. The site selected for the experiment prevented accomplishment of all of the original objectives of the LEO portion of the experiment. The four relatively close observation sites were notably different in their physical characteristics making the correlation of observations between adjacent sites extremely poor. When instrument wave data were obtained, there was generally fair agreement between observations and measurements. Surf conditions were observed to change appreciably over fairly short periods of time. The use of a single observational data set to characterize surf conditions over a one day period was not found to be a satisfactory representation. (Sinha-OEIS)
W78-06252

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX A--MAIN SHIP CHANNEL (SAN FRANCISCO BAR).
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5C.
W78-06253

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX C--WATER COLUMN.
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5B.
W78-06254

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX D--BIOLOGICAL COMMUNITY,
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5C.
W78-06255

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY, APPENDIX F--CRYSTALLINE MATRIX,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W78-06256

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX I--POLLUTANT AVAILABILITY,
California Univ., Berkeley. Lawrence Berkeley Lab.; California Univ., Berkeley. Div. of Energy and Environmental; and California Univ., Bodega Bay. Inst. of Pollution Ecology.
For primary bibliographic entry see Field 5B.
W78-06257

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX J--LAND DISPOSAL,
International Engineering Co., Inc., San Francisco, CA.
For primary bibliographic entry see Field 5E.
W78-06258

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX M--DREDGING TECHNOLOGY.
JBF Scientific Corp., Wilmington, MA.
For primary bibliographic entry see Field 5E.
W78-06259

ON THE CONTAMINATION OF SEA WATER WITH SALMONELLA AND FECAL INDICATOR ORGANISMS: I. OCCURRENCE AND DISTRIBUTION OF SALMONELLA AND FECAL INDICATOR ORGANISMS IN COASTAL SEA WATER OF FUKUYAMA, (IN JAPANESE),
Hiroshima Univ. (Japan). Dept. of Food Chem. Tech.
For primary bibliographic entry see Field 5B.
W78-06331

THE MARINE GEOLOGY AND SEDIMENTOLOGY OF HAWAII KAI, KUAPA POND, AND ADJACENT MAUNALUA BAY,
Hawaii Univ., Honolulu.
E. T. Sakoda.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 216, Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis, Geology and Geophysics, May, 1975. 71 p, 21 fig, 4 tab, 31 ref, 1 append. OWRT A-043-HI(1).

Descriptors: *Hawaii, *Marine geology, *Sedimentology, Salinity, *Temperature, *Turbidity, Weather, Storms, *Hawaii Kai, Pua Pond(HI), Maunalua Bay(HI), Kurtosis.

Marine geology and sedimentology of the Hawaii Kai area were studied, including such physical oceanographic characteristics as salinity/temperature values and turbidity. Fair weather temperature and salinity values were stable, with salinity reduced during and after rainstorms of short duration. Although the water is generally less turbid now than it was in the 1960's, it remains somewhat so due to suspended fine, clay-sized terrigenous and carbonate sediments, planktonic organisms, and terrigenous materials brought in as runoff during storms. Samples from the marina and bay were analyzed for grain size parameters and compositition, and sediments were categorized into size groups indicating their distribution. Graphic kurtosis values showed that muds were generally platykurtic, sediments on the reef flat - leptokurtic, and sediments exposed to high energy - mesokurtic. Percentages of carbonate, terrigenous, and organic material were found for the samples, with carbonate values highest seaward and terrigenous values lowest seaward. X-ray analyses were conducted for the clay fractions of terrestrial samples included kaolinite, montmorillonite, plagioclase; bulk analysis revealed magnetite, hematite, and quartz. Marina and bay samples contained calcite, kaolinite, and montmorillonite in the clay fractions, and magnesium-rich and magnesium-poor calcite, argonite, plagioclase, magnetite, kaolinite, and montmorillonite in bulk fractions. No severe adverse effects have occurred during the course of development in the area. An appendix contains a table of sample sediment parameters. (Wares-IPA)
W78-06345

PROCEEDINGS, MISSISSIPPI WATER RESOURCES CONFERENCE, 1975.
Mississippi State Univ., Mississippi State. Water Resources Research Inst.
For primary bibliographic entry see Field 2J.
W78-06351

MARINE POLLUTION: DIAGNOSIS AND TREATMENT, (MEERESVERSCHMUTZUNG: DIAGNOSE AND THERAPIE),
For primary bibliographic entry see Field 5G.
W78-06361

INDUSTRIAL POINT SOURCES OF PETROLEUM: POLLUTION LOADS AND ECONOMIC PARAMETERS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W78-06376

THE URANIUM-SERIES RADIONUCLIDES AS TRACERS OF GEOCHEMICAL PROCESSES IN LONG ISLAND SOUND,
Yale Univ., New Haven, CT. Dept. of Geology and Geophysics.
L. K. Benninger.
PhD Dissertation, May 1976. 235 p, 33 fig, 21 tab, 145 ref, 1 append. ERDA E(11-1)-3573.

Descriptors: *Tracers, *Radioisotopes, *Geochemistry, *Estuaries, Lead, Lead radioisotopes, Uranium radioisotopes, Sediments, Plankton, Runoff, Heavy metals, Rivers, *Long Island Sound.

Natural series radionuclides are useful probes into estuarine geochemistry because of the time-dependent relationships among them, and because, as analogs of stable elements, they are much less subject to contamination during sampling and analysis. In this study, the flux of heavy metals through Long Island Sound was considered in light of the material balance for excess Pb210, and analyses of concurrent seston and water samples from central Long Island Sound were used to probe the internal workings of the estuary. In general, the plankton appear not to act as important agents of deposition for uranium-series radionuclides. Uranium is at most very slightly concentrated in plankton. Ra226 may sometimes be in enriched plankton, but it appears to be lost from surficial sediments. Pb210, which is known to be efficiently deposited, is not concentrated in the net plankton and probably sorbs non-specifically on the more abundant nonliving particles. Po210 is, by contrast, certainly highly concentrated in zooplankton and probably also in some organic debris; this separation from Pb210 causes Po210 to be maintained preferentially in suspension. (Sims-ISWS)
W78-06379

HYDROCARBONS IN CORES OF NORTHWESTERN ATLANTIC COASTAL AND CONTINENTAL MARGIN SEDIMENTS,
Woods Hole Oceanographic Institution, MA. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-06384

ENVIRONMENTAL ISOTOPIC STUDY OF THE CAMPI FLEGREI (NAPLES, ITALY) GEOTHERMAL FIELD,
Comitato Nazionale per le Ricerche Nucleari, Pisa (Italy). Lab. di Geologia Nucleare.
For primary bibliographic entry see Field 2K.
W78-06387

INFLOW AND WITHDRAWAL CHARACTERISTICS OF STRATIFIED FLUIDS,
Catholic Univ. of America, Washington, DC. Dept. of Civil Engineering.
T. W. Kao.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 8; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 97-107, 1976. 2 fig, 15 ref. NSF ENG-75-09347.

Descriptors: *Stratified flow, *Density currents, *Lakes, *Model studies, Mathematical models, Inflow, Withdrawal, Stratification, Upwelling, Thermocline, Theoretical analysis, Analytical techniques, Thermal stratification, Flow, Currents(Water), Discharge(Water), Equations.

Inflow and withdrawal characteristics of stratified fluids of arbitrary stratification were presented in the two-dimensional context. A brief summary of the dynamics of establishment of selective withdrawal of stratified fluid was given, emphasizing the role of columnar disturbances. A criterion for selective withdrawal was discussed based on the ability of the fastest propagating mode to travel upstream. The fata of inflows takes the form of a density or gravity current. Various cases were discussed. The surface discharge of lighter (or warmer) inflow was presented. The density and flow structures from a numerical model (under development at the Catholic University) and their implications to coastal oceanic fronts including downwelling and upwelling were noted briefly. If the ambient is stratified and the fluid occurs as an interflow, the speed of the density current may be estimated. On assuming that the ambient stratification is undisturbed, the result gives the current velocity U to be equal to Nh/2. The corresponding interflow Froude number is 1/2. However, it should be noted that the level at which the inflow settles down to an interflow is generally higher than the level where the inflow equals the density of the ambient. This is because of the entrainment of lighter during the progress of the inflow downwards. (See also W78-06388) (Humphreys-ISWS)
W78-06394

REAL-TIME FLOW IN UNSTRATIFIED SHALLOW WATER,
Rosenstiel School of Marine and Atmospheric Science, Div. of Ocean Engineering.
J. D. Wang.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 104, No WW1, Proceedings Paper 13571, p 53-68, February 1978. 10 fig, 16 ref, 2 append.

Descriptors: *Estuaries, *Water circulation, *Model studies, Mathematical models, Finite element analysis, Tides, Waves(Water), Winds, Flow, Bays, Shallow water, Hydrodynamics.

A finite element model for prediction of time-dependent flow in shallow coastal areas was presented. The model was based upon the vertically integrated equations of motion, combined with the hydrostatic. The time integration scheme evolved on a grid with variables staggered in time and was conditionally stable. Consistent treatment of boundaries was facilitated by the flexible grid layout, and the finite element method allows straightforward treatment of convective terms throughout the domain. All variables were defined at the same points in space. The model was applied to predict tidal flow induced by a hypothetical cooling water circulation system. (Sims-ISWS)
W78-06400

SURVEY OF TRACE METAL CONTENTS OF SUSPENDED MATTER IN THE ST. LAWRENCE ESTUARY AND SAGUENAY FJORD,
Quebec Univ., Rimouski. Inst. National de la Recherche Scientifique.
For primary bibliographic entry see Field 5A.
W78-06401

AUTOMATIC MONITORING TECHNIQUES OF EUTROPHICATION SUBSTANCES IN COASTAL SEA WATER (FY 1976-1978), (SANGYO HAISUI NO FUEIYOKASEIBUN NO SHORI NI KANSURU KENKYU-KENSHUTAUKI HAIHATSU NI KANSURU KENKYU),
Government Industrial Research Inst., Osaka (Japan).
For primary bibliographic entry see Field 5A.
W78-06469

AN ASSESSMENT OF ESTUARINE AND NEARSHORE MARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point. Applied Marine Science and Ocean Engineering.
M. P. Lynch, B. L. Laird, N. B. Theberge, and J. C. Jones.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 853, Price codes: A07 in paper copy, A01 in microfiche. Special Report No 93 (Revised) to Office of Biological Services, Fish and Wildlife Service as part of the 1975 National Water Resources Assessment, March 1976. 143 p, 4 fig, 34 tab.

Descriptors: *Estuaries, *Environmental effects, Water resources, *Land use, *Water pollution effects, Baseline studies, Estuarine environment, Economics, Resources development, United States, *Outer Continental Shelf, Nearshore environments, Environmental assessment.

The impact of water uses and projected water demands upon the estuarine and nearshore marine environments of the United States has been evaluated. This evaluation has included a regional review of major estuarine and nearshore marine habitats, the economic value of the areas, the major problems impacting water and water resources, and the management approach of the states. Federal management initiatives, particularly with regard to Federal-State interactions, have also been reviewed. Conflicts between recreational and commercial users highlight problems of resource allocation and space allocation both of the adjoining shoreline and the water itself. These conflicts will increase in frequency and intensity, particularly if the projected increases in recreational demands and consumption

of fisheries products based on population trends and present consumption are realized. (Sinha-OEIS)
W78-06528

OIL SPILLS, AND SPILLS OF HAZARDOUS SUBSTANCES.
Environmental Protection Agency, Washington, D.C. Div. of Oil and Hazardous Materials.
For primary bibliographic entry see Field 5B.
W78-06529

THE SEVERN ESTUARY AND THE BRISTOL CHANNEL, AN ASSESSMENT OF PRESENT KNOWLEDGE.
Bristorl Univ. (England).; and University Coll. of Swansea (Wales); and Institute of Coastal Oceanography and Tides Birkenhead (England); and Institute for Marine Environmental Research, Edinburgh (Scotland).
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-037 877, Price codes: A02 in paper copy, A01 in microfiche. The Natural Environment Research Council Publications Series C, No 9, December 1972. 24 p, 264 ref.

Descriptors: *Estuaries, Water resources, *Water quality, Baseline studies, Resources development, Pollution abatement, *Outer Continental Shelf, *United Kingdom, *Severn Estuary, Bristol Channel, Transfer processes.

An assessment is made of current understandings of the geology and sedimentology; water movements and other physical aspects; chemistry; and biology of the Severn Estuary and the Bristol Channel. These understandings are intended to serve as measurement baselines for the prevention and control of the water quality alterations by future uses of the area. (Sinha-OEIS)
W78-06530

OBSERVATIONS OF WINDS AND CURRENTS IN HOOD CANAL,
Washington Univ., Seattle. Dept. of Oceanography.
L. H. Larsen.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-039 501, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No 350, Reference No M76-47, June 1976. 36 p. ONR-N00014-75-C-0502.

Descriptors: *Tidal effects, *Winds, *Currents(Water), Baseline studies, Resources development, Water resources, *Washington, *Outer Continental Shelf, *Pollutant transport, *Tidal flow, Water characteristics, Transfer processes, *Hood Canal(Wash), Puget Sound(Wash).

Selected portions of data collected in Hood Canal during the months of March 1976 through June 1976 are presented. This document is a report to the Navy on tidal currents in the vicinity of the refit facility at Bangor, Washington. The data input for this report comes from 5 moorings of Aanderra current meters, each mooring having 3 instruments. Currents were measured during the months of March, April, May, and June 1976. In addition, tide height, wind direction and magnitude were monitored at the Keyport Bangor Pier. (Sinha-OEIS)
W78-06532

MODELING OF OIL EVAPORATION IN AN AQUEOUS ENVIRONMENT (RESEARCH ON THE EFFECTS OF CRUDE OIL TRANSFER AND UPSTREAM REFINERIES ON DELAWARE BAY),
Delaware Univ., Newark. Dept. of Civil Engineering; and Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5G.
W78-06533

BEACH NOURISHMENT TECHNIQUES. REPORT 2: A MEANS OF PREDICTING LITTORAL SEDIMENT TRANSPORT SEAWARD OF THE BREAKER ZONE,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
A. W. Garcia, and F. C. Perry.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-032 349, Price codes: A04 in paper copy, A01 in microfiche. Technical Report No H-76-13, October 1976. 64 p, 11 fig, 71 ref.

Descriptors: *Sediment transport, *Hydraulics, *Water quality, Baseline studies, Resources development, *Outer Continental Shelf, Beach nourishment, Longshore currents, Spoil disposal, Breaker zone.

A method of determining, as a function of water depth, the amount of sediment entrained into the longshore current regime seaward of the breaker zone is developed and presented, the objective being the nourishment of beaches by offshore dumping of sediment such as by hopper dredge. A summary and general description of previous related investigations are included. Wave hindcast data compiled by National Marine Consultants for the years 1956, 1957, and 1958 were used as input to the method for verification purposes. The site of verification was Point Pedernales, California. Figures showing the computed and measured longshore sediment transport are included for comparative purposes. (Sinha-OEIS)
W78-06534

THE INTERTIDAL FAUNA OF SANDY BEACHES. A SURVEY OF THE SCOTTISH COAST,
Aberdeen (Scotland). Marine Lab.
A. Eleftheriou, and A. D. McIntyre.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 959, Price codes: A04 in paper copy, A01 in microfiche. 1976. 65 p, 23 tab, 15 ref.

Descriptors: *Beaches, *Aquatic life, *Intertidal areas, *Ecology, Baseline studies, Resources development, Environmental effects, *Outer Continental Shelf, *Intertidal fauna, *Scotland, Environmental conditions.

The study of a number of sandy beaches covering a range of environmental conditions revealed faunistic variation which reflected the different species' tolerance of or preference for the conditions prevailing on particular beaches. Whenever a balanced situation in the environmental conditions existed, especially between shelter and exposure, a typical marine north-temperate water community characterized by the bivalve Tellina tenuis was present. This community included a basic faunistic complement consisting of polychaetes (both sessile and errant) such as Nerine cirratulus and Ophelia rathkei in the middle beach and Paraonis fulgens, Arenicola marina, Spio filicornis, Scoloplos armiger, Nephtys cirrosa and N. hombergi at the lower levels and a few crustaceans (Talitrus saltator, Haustorius arenarius, Bathyporeia pilosa, and Eurydice pulchra on the upper beach and Bathyporeia pelagica, B. elegans, Pontocrates norvegicus and P. arenarius on the lower foreshore). (Sinha-OEIS)
W78-06535

LECTURES ON ESTUARINE CIRCULATIONS AND MASS DISTRIBUTIONS,
Johns Hopkins Univ., Baltimore, MD. Dept. of Earth and Planetary Sciences; and Johns Hopkins Univ., Baltimore, MD. Dept. of Mechanics and Materials Sciences.
R. R. Long.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-034 119, Price codes: A05 in paper copy, A01 in microfiche. Technical Report No 9 (Series C), December 1976. 98 p, 8 fig, 54 ref. ONR-N00014-75-C-0805.

Descriptors: *Estuarine environment, *Circulation, *Mixing, *Saline water intrusion, Baseline studies, Pollution abatement, Resources development, Turbulence, *Outer Continental Shelf, *Mass distribution, Pollutant transport, Transfer processes, Estuarine characteristics, Density distribution.

A detailed discussion is presented to explain the characterization and characteristics of bodies of water identified as estuaries. A group of estuaries are classified in part on the relative strength of the turbulence that causes the mixing of waters of different salinity (density). Under discussion is the relevance of the source of fresh water to the variety of processes within such bodies of water. (Sinha-OEIS)
W78-06538

OIL SPILL AND OIL POLLUTION REPORTS NOVEMBER 1976 - JANUARY 1977,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06539

OIL SPILL AND OIL POLLUTION REPORTS AUGUST 1976 - OCTOBER 1976,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06540

OIL SPILL AND OIL POLLUTION REPORTS MAY 1976 - JULY 1976,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06541

OIL SPILL AND OIL POLLUTION REPORTS MAY 1975 - JULY 1975,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06545

PROCESSES, PROCEDURES AND METHODS FOR CONTROL OF POLLUTION FROM SALT WATER INTRUSION.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-06547

WAVE CLIMATE AT SELECTED LOCATIONS ALONG U.S. COASTS,
Coastal Engineering Research Center, Fort Belvoir, VA.
E. F. Thompson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 904, Price codes: A16 in paper copy, A01 in microfiche. Technical Report No. TR-77-1, January 1977. 366 p, 18 fig, 7 tab, 23 ref, 2 append.

Descriptors: *Waves(Water), *Baseline studies, *Ocean waves, Water resources, Resources development, Sediments, Erosion, Sedimentation, *Outer Continental Shelf, *Wave measurements, *Wave climate, *Pollutant transport, *Transfer processes, U.S. East Coast, U.S. West Coast, U.S. Gulf Coast, Nearshore processes.

Summaries of nearshore wave measurements from 19 locations along the Atlantic, Gulf, and Pacific coasts is published to provide coastal engineers and coastal researchers aid in planning coastal operations, estimating coastal sediment movement, designing coastal structures and for other applications. However, because recording and analyzing reliable wave climate data are expensive and time consuming, there is a paucity of field wave data, thus a secondary purpose of this report is to provide details and a perspective on the various wave measurement, recording, and analysis systems used by the Beach Erosion Board (BEB) and CERC. Three basic wave gages have been used in the BEB-CERC wave data collection program: two staff gages (the step-resistance gage and the continuous-wire gage) and an underwater pressure-sensitive gage. Data recording and analysis techniques are discussed including the different methods used by CERC for analyzing pen and ink records. (Sinha - OEIS)
W78-06548

POLLUTANT TRANSFER TO THE MARINE ENVIRONMENT.
Rhode Island Univ., Kingston; and Texas Univ. at Austin. Port Aransas. Marine Science Inst.
For primary bibliographic entry see Field 5B.
W78-06549

FUNDAMENTAL ANALYSIS OF THE LINEAR MULTIPLE REGRESSION TECHNIQUE FOR QUANTIFICATION OF WATER QUALITY PARAMETERS FROM REMOTE SENSING DATA,
Old Dominion Univ., Norfolk, VA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-06550

MICROWAVE RADIOMETRIC SENSING OF SURFACE TEMPERATURE AND WIND SPEED FROM SEASAT,
Radiometric Technology, Inc., Wakefield, MA.
R. A. Porter, and P-T. Ho.
Final Report, Feb. 1977. (Prepared for National Oceanic and Atmospheric Administration, Dept. of Commerce) 155 p, 92 fig, 11 tab, 14 ref, 5 append.

Descriptors: *Oceans, *Water temperature, *Wind velocity, Effects, Sea water, Algorithms, Solar radiation, Brightness temperatures, Ocean surfaces, Mathematical models, Systems analysis, Equations, *Seasat, *Microwaves, *Remote sensing.

A comprehensive study has been performed to determine accuracy with which sea surface temperatures and wind speeds can be derived from brightness temperatures to be sensed by the SEASAT SMMR microwave radiometer. This work was based on the use of a 2-scale ocean roughness model, developed during the course of previous studies. Also, an improved 2-section ocean foam model, consisting of whitecaps and foam streaks, was applied to work performed in the study. Eleven microwave frequencies were used, together with ten atmospheric models, covering Sub-Polar, Mid-Latitude and Tropical regions. Wind velocities ranged from 4/msec., to 20 m/sec. All computations were performed at a single antenna beam incidence angle of 48.9 degrees, which is the SEASAT viewing angle. The seawater salinity was fixed at 34 deg/oo. The final operating frequencies, recommended for use on SEASAT, are 6.6, 10.69 and 18 Ghz. An evaluation was performed on the effects of scattered solar radiation on sea surface brightness temperatures to be measured with a 6.6 GHz radiometer. It is estimated that the solar contribution will range from 0.4 to 11 deg K, depending on the wind speed. An algorithm, for deriving sea surface temperatures, has been developed for use on SEASAT. Computer simulations resulted in a derived surface temperature within 0.7 deg K and a wind speed within 0.3 m/sec., of the correct value, in the presence of 6 mm/hr. rain. A set of concentrations and recommendations is presented. The real and imaginary parts of the dielectric permittivities of model whitecaps and foam streaks behave similarly, as a function of frequency, to those of sea water, as a consequence of the modeling. (Bell-Cornell)
W78-06551

SALTWATER INTRUSION IN THE SHALLOW AQUIFER IN PALM BEACH AND MARTIN COUNTIES, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06584

ELUTRIATION STUDY OF WILLAMETTE RIVER BOTTOM MATERIAL AND WILLAMETTE-COLUMBIA RIVER WATER,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 5C.
W78-06592

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

ELECTRO-REGENERATED ION-EXCHANGE DEIONIZATION OF DRINKING WATER,
Southern Research Inst., Birmingham, AL.
For primary bibliographic entry see Field 5F.
W78-06281

FIFTH INTERNATIONAL SYMPOSIUM ON FRESH WATER FROM THE SEA,
Office of Naval Research, London (England).
R. H. Nunn.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 625, Price codes: A02 in paper copy, A01 in microfiche. ONR Report No. C-17-76, July, 1976. 14 p, 1 fig, 1 tab.

Descriptors: *Water quality, Oceans, *Desalination, *Desalination apparatus, *Desalination processes, Economics, Technology, Energy, Waste water treatment.

The subject coverage of the Fifth International Symposium on Fresh Water from the Sea, held May 16-20, 1976, Alghero, Sardinia, Italy, is reviewed. Sessions on regional reviews, economis, and the use of fluidized beds in evaporative systems are highlighted. Economy was emphasized in the conference, with implications for the future of multi-stage flash evaporation systems in the presence of rising fuel costs discussed. Topics for papers presented at the conference included: regional reviews, economic consideration, agro-industrial complexes, recovery of chemicals, distillation processes, heat and mass transfer, scale formation/prevention, construction materials, corrosion, multi-stage flash fluidized bed evaporators, vertical tube evaporators, horizontal tube evaporators, vapor compression, effluents from desalting plants, desalination and power generation, geothermal desalination, solar evaporation, ion-exchange, ion-exchange membranes, electrodialysis, piezodialysis, ice formation, freezing processes, hydrates, reverse osmosis membranes, reverse osmosis processes, and hollow fibers. The conference consensus was that desalination has reached a point of high technology; however, future implementation is contingent upon the energy market. (Wares-IPA)
W78-06301

DESALINATION TECHNIQUES FOR CONVERSION OF BRACKISH WATER INTO POTABLE WATER FOR SMALL COMMUNITIES,
A. V. Rao, and D. J. Mehta.
In: Desertification and Its Control, Indian Council of Agricultural Research, New Delhi, 1977, 1 fig, 7 tab, p 149-154.

Descriptors: *Desalination, *Desalination processes, *Desalination apparatus, *Solar stills, *Potable water, Water supply, Saline waters, Brackish water, *Water treatment, Arid lands, Semiarid climates, Osmosis, Electrodialysis, *India.

Various techniques for supplying potable water to small communities in India that presently have saline or brackish water are presented. Three desalination techniques developed by the Central Salt & Marine Chemicals Research Institute are discussed: (1) use of solar stills, (2) reverse osmosis, and (3) electrodialysis. Solar stills are ideal for small isolated communities where the water requirement is low, the needed power is not available, and the water is saline. Solar stills are simple to construct and the operating and maintenance costs are small. The operation of a solar still is briefly explained. Reverse osmosis employs semipermeable non-ionic membranes for the purification of water. Its advantages are presented. Electrodialysis employs perm selective membranes for the desalination of brackish water. Its operating procedure and advantages are discussed. The estimated capital costs and the operating costs for plants of 5,000 liter-per-day capacity of solar stills and 10,000 liter-per-day of the other two types are presented. (Jamail-Arizona)
W78-06340

ORANGE COUNTY AUGMENTS WATER SUPPLY WITH RECLAMATION SYSTEM.
For primary bibliographic entry see Field 5D.
W78-06487

METHOD AND APPARATUS FOR CONVERTING SALINE WATER TO FRESH WATER,
P. S. Roller.
U.S. Patent No. 4,054,493, 6 p, 1 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 963, No 3, p 986, October 18, 1977.

Descriptors: *Patents, *Desalination apparatus, *Demineralization, *Saline water, Descaling, Separation techniques, Flash distillation, Sea water.

Preheated saline water, typically sea or brackish water, is further heated by quanta of steam, passed to it at differential temperatures and pressures and condensed in the saline water. Scale compounds are precipitated and scale-forming bicarbonates decomposed, with the evolution of carbon dioxide, which is gathered and expelled by steam accessory to the quanta of steam. Post-thermal saline water, which is formed, is multi-stage flash vaporized while self-cooling. The flashed vapors are compressed to form the quanta of steam. After being further cooled while preheating saline water, post-thermal saline water is evaporated in a multistage vapor compression evaporator, producing brine at a high concentration factor. Relative to equilibrium in scale-compound precipitation between 302 deg. F and 347 deg F, the recovery of fresh water is 70% to 80% for sea water, and 80% to 90% for brackish waters over a wide range of salinity. (Sinha-OEIS)
W78-06660

3B. Water Yield Improvement

THE ADAPTIVE CHARACTERISTICS OF DESERT PLANTS,
Harvard Univ., Cambridge. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-06337

DRIP IRRIGATION TO REVEGETATE MINE WASTES IN AN ARID ENVIRONMENT,
ASARCO, Inc., Tucson, AZ.
S. A. Bengson.
Journal of Range Management, Vol. 30, No. 2, p 143-147, March 1977. 12 fig, 2 ref.

Descriptors: *Irrigation practices, *Revegetation, *Irrigation systems, *Mine wastes, Irrigation design, Water conservation, Arid lands, Arizona, *Drip irrigation.

A study was made of several different drip irrigation methods and available equipment, and advantages and disadvantages noted. The project, still underway in 1977, resulted in the successful revegetation of the previously mine-wasted Asarco Sacaton mine in southern Arizona. Drip irrigation offered many advantages over other methods on steep slopes. There was less hazard of runoff and erosion with this method, excessive salt and phytotoxins were leached from the root zones, it was adaptable to remote areas wihtout pressurized water systems, it conserved water, and it helped promote deep root growth and better plant development. (Castricone-Arizona)
W78-06339

HYDRAULIC FRACTURING OF DRILLED WATER WELLS IN CRYSTALLINE ROCKS OF NEW HAMPSHIRE,
New Hampshire Dept. of Resources and Economic Development, Concord. State Geologists Office.
For primary bibliographic entry see Field 4B.
W78-06372

WEATHER MODIFICATION ACTIVITIES IN KANSAS 1972-1977,
Kansas Water Resources Board, Topeka.
D. F. Kostecki.
Bulletin 22, Special Report to the Governor and Legislature, 1977. 18 p, 2 tab.

Descriptors: *Weather modification, *Rainfall, *Projects, *Kansas, Cloud seeding, Silver iodide, Salts, Evaluation, Rain gages, Radar, Data collections, Data processing, Cloud physics, Meteorology.

The State of Kansas entered the field of weather modification in 1972 when the Kansas Water Resources Board began a series of three field experiments during the summer months. With the passage of the Kansas Weather Modification Act in 1974, the Board was given broad responsibilites, including the issuing of licenses and permits to conduct weather modification or cloud seeding activities, and the encouragement of research and development projects. Since early 1975, the Board has been working partner with the U.S. Bureau of Reclamation in the High Plains Cooperative Program (HIPLEX), a multi-year intensive research effort to remove critical scientific uncertainties about the effectiveness and reliability of cloud seeding. The Board has sponsored several research projects related to, and in support of, the HIPLEX. During this same period, groundwater management districts and several counties in parts of western Kansas have sponsored and conducted operational cloud seeding projects. The Board has attempted to assist these operational projects, primarily by enhancing their data collection capability as a first step toward quantitative evaluation of effects. (Sims-ISWS)
W78-06382

AN EXPERIMENTAL EVALUATION OF THE EFFECTIVENESS OF ANTITRANSPIRANTS ON SELECT PLANT SPECIES,
Colorado Univ., Boulder. Dept. of Chemical Engineering.
F. Kreith, and J. E. Anderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 579, Price codes: A03 in paper copy, A01 in microfiche. Supplement to Completion Report, September, 1975. 23 p, 8 fig, 4 tab, 13 ref. Submitted jointly to Bureau of Land Management. OWRT B-099-COLO(3). 14-31-0001-4065.

Descriptors: *Antitranspirants, Phreatophytes, Water conservation, *Water yield improvement, *Chemcontrol, *Tamarix, *Photosynthesis, *Transpiration control, Phytotoxicity, Soil moisture, Measurement, Roadways.

The objective was to evaluate the potential of using chemical antitranspirants on phreatophyte communities to increase watershed runoff and streamflow. More specifically, the research included (1) laboratory evaluation of the effects of the most promising antitranspirants currently available on transpiration and photosynthesis of Tamarix sp. (2) phytotoxicity trials in the laboratory and in the field, and (3) field evaluation of one antitranspirant on Tamarix at the U. S. Bureau of Reclamation Evapotranspirometer Site at Bernardo, New Mexico. The original work plan was modified to include antitranspirant screening studies for the U. S. Bureau of Land Management (BLM) to evaluate in the laboratory the effects of two antitranspirants on transpiration and photosynthesis of several species representative of roadside vegetation. Transpiration and net photosynthesis were measured with an open, gas exchange system. The results indicate that Mobileaf, Wilt Pruf, or similar antitranspirant formulations will effectively reduce transpiration of herbaceous species on the laboratory. Antitranspirant effectiveness, when corrected for growth of controls, appears to be satisfactory for 10-14 days after spraying. The similarity of antitranspirant effects on four species suggests that similar laboratory results could be expected with most herbaceous range or roadside species. Several commercial growth retardants have been reported to have antitranspirant properties. Samples were obtained of two (Alar, a UNIROYAL product, and Atrazine, from CIBA-GEIGY Corp.) for laboratory trials singly and in combination with film-forming antitranspirants. The initiation of a small scale field study is recommended to attempt to quantify the magnitude of actual water savings along roadways by various antitranspirant treatments, including mowing. Comparing soil moisture on clipped and unclipped roadside stands should indicate the maximum potential for water savings and provide a good baseline to which values from areas treated with chemical antitranspirants could be compared.
W78-06411

3C. Use Of Water Of Impaired Quality

UTILIZATION OF BRACKISH WATER IN COAL GASIFICATION,
New Mexico State Univ., University Park. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 3E.
W78-06204

LEVEL OF CHEMICAL SUBSTANCES IN FARM CROPS GROWN ON SOIL IRRIGATED BY WASTE WATERS FROM BY-PRODUCT COKING PLANTS (ROUGH DRAFT),
Scientific Research Inst. for Foods Sanitation, Kiev (USSR). Physico-Chemical Lab.
N. M. Barabanova, L. P. Polushchuk, and L. Stemikovskaya.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-tr-2957, Price codes: A02 in paper copy, A01 in microfiche. Report ORNL-tr-2957, (1975). Translation from Voprosy Pitaniya, No. 5, p 76-79, 1973. 4 p, 4 tab, 6 ref.

Descriptors: *Irrigation effects, *Plant growth, *Crop response, *Crop production, Soil chemical properties, Water reuse, Corn(Field), Potatoes, *Coke-chemical plant waste irrigation, *Waste water irrigation.

The quality of potatoes and corn grown on land irrigated with coking-chemical plant waste waters which contain various chemicals was investigated. Basic chemical ingredients in the wastewaters included: phenols, pyridine, napthaline, benzene, iron, ammonia, nitrites, nitrates, chlorides, sulfates, sulfites, sulfides, cyanides, and thiocyanates. Crop lands were irrigated with dilutions of waste waters; irrigation with undiluted waste water and waste water diluted 1:4 resulted in significant depression of plant growth, and further irrigation was discontinued. Both corn and potatoes grown on soil irrigated with waste waters from by-product coke plants accumulated nitrates, ammonia, sulfates, and chlorides. In the potato tubers, the monoatomic phenols (when irrigated with undiluted waste waters) and nitrates (irrigated 5 times with a 1:8 dilution) were high compared to controls. The other organic substances (sulfides, cyanides, and thiocyanates) in the materials studied were absent; this is probably due to their destruction in the soil and in the plants. (Seip-IPA)
W78-06272

DESERTIFICATION IN THE UNITED STATES,
International Center for Arid and Srmi-Arid Lands Studies, Lubbock, TX.
For primary bibliographic entry see Field 4D.
W78-06333

EFFECT OF SULFURIC ACID ON AMMONIA VOLATILIZATION UNDER FIELD CONDITIONS,
Arizona Univ., Tucson. Dept. of Soil, Water and Engineering.
T. A. Yahia.
Ph.D. Dissertation, 1977. 71 p, 8 fig, 14 tab, 45 ref.

Descriptors: *Irrigation water, *Ammonia, *Ammounium compounds, *Nitrogen, *Fertilizers, Nitrogen compounds, Arid lands, Semiarid climates, *Hydrogen sulfide, Calcium, Alkaline soils, Irrigation.

Anhydrous ammonia was applied in irrigation water along with and without adding sulfuric acid. Ammonia losses by volatilization were measured indirectly by measuring nitrogen in soils, plant tissues, and irrigation water at two field locations. The study showed that adding sulfuric acid with irrigation water reduced the loss of nitrogen through ammonia volatilization. The acid is effective in reducing NH 3 losses under alkaline soil conditions in arid and semiarid climates, especially when the irrigation water contains high levels of sodium relative to calcium. It is recommended that sulfuric acid which is produced as an industrial by-product be used as an aid to reduce ammonia volatilization losses under field conditions. (Jamail-Arizona)
W78-06335

METHODS FOR AN INVESTIGATION OF UREA-N LOSS IN ARIZONA AGRICULTURAL WATERS DUE TO UREASE ACTIVITY,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W78-06336

QUALITY OF PERCOLATE BELOW THE ROOT ZONE OF SELECTED VEGETABLES GROWN IN NORTHERN GUAM,
Guam Univ., Agana. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-06582

USE OF WARM WATER AFTER COOLING COMPRESSORS AND CONDENSERS (ISPOL'ZOVANIE V PROIZVODSTVE TEPLOI VODY POSLE OKHLAZHDENIYA KOMPRESSOROV I KHOLODIL'NIKOV),
Solikamskii Tsellyulozno-Bumazhnyi Kombinat (USSR).
V. A. Kokh, P. A. Zagorodskikh, N. N. Naimushin, and P. M. Cherepov.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No 20, p 5-6, 1977. 1 fig.

Descriptors: *Cooling water, *Water reuse, *Industrial water, Pulp and paper industry, Effluents, Wastes, Industrial wastes, Water pollution sources, Heated water, Water, Rivers, Pumps, Valves, Water distribution(Applied), Water pressure, Oily water, Water pollution treatment, Soviet Union(USSR).

Purified river water is used for cooling compressors and terminal condensers at the Solikamsk pulp and paper mill (USSR). The water is then dumped into a sewer system. A separate pump and water line were installed in the existing fire-dousing system. Through the use of valves and pumps, various water pressures can be directed to either system. In the case of fire, pressure in the water supply system is increased by a special pump, and water from the compressors is pumped into the sewer system for use. When pressure in the fire system is lowered, water from the compressors is automatically pumped back into their water supply system. Oil in the water from the oil-cooled condensers is also expelled by the use of pumps and a separator. (DuVall-IPC)
W78-06638

GEOTHERMAL POWER SYSTEM,
For primary bibliographic entry see Field 8G.
W78-06659

EFFECT OF CHLOROCHOLINE CHLORIDE ON THE RESISTANCE OF WHEAT TO AN EXCESS AND DEFICIENCY OF THE WATER SUPPLY DURING THE CRITICAL PERIOD (IN RUSSIAN),
Komsomolskii-na-Amure Gosudarstvennyi Pedagogical Inst. (USSR).
G. A. Vorobeikov.
Fiziol Rast (MOSC) 23(3), p 573-578, 1976.

Descriptors: *Chlorides, *Wheat, Water supply, *Chlorocholine chloride.

The effect of CCC (chlorocholine chloride) on the resistance of wheat plants, cultivar 'Dalnevostochnaya', to excess and deficient water supply was studied in vegetation experiments during the critical period. Spraying of the leaves with the preparation or its introduction into the soil 5 days prior to drought or inundation, as well as moistening the seeds, decreased negative consequences of unfavorable water supply on plants. Treatment of the plants with CCC is also effective when soil humidity changes sharply (drought and inundation). Physiological processes (growth, water regime, permeability and viscosity of the protoplasm, the content of chlorophyll and protein N) are less interfered with in the treated plants and more viable pollen grains in the ears are formed in these plants. Drought resistance decreased if they had been treated with CCC 2 days after irrigation was stopped; this seems to be a result of the primary depression of physiological processes during the first 2-3 days after the treatment and in the course of drought. Treatment of the plants with CCC is recommended prior to inundation or drought to decrease damage.--Copyright 1977, Biological Abstracts, Inc.
W78-06692

3D. Conservation In Domestic and Municipal Use

MANAGEMENT OF URBAN RUNOFF AND WASTEWATER IN THE OSLOFJORD AREA,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5G.
W78-06214

AN EXAMPLE OF EXCESS URBAN WATER CONSUMPTION,
Calgary Univ. (Alberta). Dept. of Civil Engineering.
M. Gysi, and G. Lamb.
Canadian Journal of Civil Engineering, Vol 4, No 1, p 66-71, March 1977. 4 tab, 4 ref.

Descriptors: *Municipal water, *Water consumption(Except consumptive use), Effects, *Pricing, *Metering, *Canada, Summer, Winter, Water supply, Benefits, Costs, Prairie cities, Water utilization.

A study of urban water consumption in the prairie cities is being undertaken to determine what effect metering or pricing policies can have on summer and winter consumption, and eventually on the long run benefits and costs of supply. Of particular interest is the comparison of consumption patterns in Calgary and Edmonton, the two 'twin' cities of Alberta. These two cities are very similar in size, industrial-residential mix, and climate, but Calgary uses more than twice as much water in the residential sector, where over 80% of the customers are unmetered. Initial analysis of the data indicates that the increased consumption is due mainly to the difference in pricing policies used by the two cities. (Bell-Cornell)
W78-06575

3E. Conservation In Industry

UTILIZATION OF BRACKISH WATER IN COAL GASIFICATION,
New Mexico State Univ., University Park. Dept. of Chemical Engineering.
J. A. McNeese, and D. B. Wilson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 146, Price codes: A04 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, WRRI Report No 063, January 1976. 48 p, 16 fig, 6 tab, 13 ref. OWRT A-051-NMEX(1).

Descriptors: *Coal gasification, *Brackish water, *Industrial water, Water utilization, Corrosion, Impaired water quality, *Leaching, *Leachates, Salts, *Salt deposition(Industrial), Sodium chloride, Sodium sulfate, Potassium chloride, *Chlorides, *Sulfates, Water pollution sources, Aquifers.

When coal is utilized for production of synthetic natural gas, approximately 11,000 acre feet a year will be required for the daily production of 300 million cubic feet (STP) of gas. A major advance would occur in gasification development if part of the required water could be supplied from brackish water sources. The main consideration in the use of brackish water as process water is the deposition of the salts from the brackish water. Three salt systems supplied from a synthetic saline solution were analyzed for salt deposition during the gasification of a coal-salt solution paste. The salts studied were sodium chloride, potassium chloride, and sodium sulfate. The study examined the leachability of these salts from the product coal-ash; most of the salts introduced into the reactor system were leachable either from the product mixture or from the reaction vessel. The salt material balance could be closed by accounting for salts carried from the system either as mist or as particulate. While not a definite deterrent to the use of brackish water in an in-situ gasification process, the leaching of these salts into ground water and subsequent deterioration of the ground water aquifer would have to be considered. In the case of the Lurgi reactor system, brackish water could not be used until corrosion considerations had been examined. Conclusions were: Common brackish water salts are leachable from the spent reaction zone products in a packed bed gasification reactor. Ash fusion may occur at temperatures well below expected high silica ash fusion points. Potential damage to aquifers could result from salt migration from a spent in-situ reaction bed. In a packed bed reactor salts tend to migrate out the bed interior to the reactor wall.
W78-06204

LIQUIDATION OF THERMAL ELECTRIC POWER STATION WASTE WATERS - ACTUAL TECHNICAL PROBLEMS (ROUGH DRAFT),
For primary bibliographic entry see Field 5D.
W78-06271

MERCURY RECOVERY FROM CONTAMINATED WASTE WATER AND SLUDGES,
Georgia-Pacific Corp., Bellingham, WA. Bellingham Div.
For primary bibliographic entry see Field 5D.
W78-06286

SYMPOSIUM PROCEEDINGS: ENVIRONMENTAL ASPECTS OF FUEL CONVERSION TECHNOLOGY, II (DECEMBER 1975, HOLLYWOOD, FLORIDA).
Research Triangle Inst., Research Triangle Park, NC.
For primary bibliographic entry see Field 5D.
W78-06302

WASTE MANAGEMENT OF FUELS PROCESSING EFFLUENTS,
Exxon Research and Engineering Co., Florham Park, NJ.
For primary bibliographic entry see Field 5D.
W78-06306

WATER REQUIREMENTS FOR AN INTEGRATED SNG PLANT AND MINE OPERATION,
Water Purification Associates, Cambridge, MA.
D. J. Goldstein, and R. F. Probstein.
In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology, II (December 1975, Hollywood, Florida), p 307-332. 5 fig, 21 tab, 41 ref, 1 append. SIA74-19080-A01, 68-03-2207.

Descriptors: *Fuels, *Mining, *Water requirements, *Water supply, Land reclamation, Evaporation, Waste disposal, Economics, Geographical regions, Facilities, Coals, *Synthetic natural gas, Lurgi process, Fuel conversion.

A summary of water requirements for an integrated synthetic natural gas (SNG) plant and mine operation is given from estimates derived from illustrated data on process net consumption of water consistent with the Lurgi process design. The water consumed includes not only water for the conversion process, but also water evaporated for cooling and consumed in mining, land reclamation, and solids disposal. Since published information on these water requirements by type varies by more than fourfold, details of a procedure for determining such water requirements are given. The determination of the cost of not evaporating water for cooling, but of using air cooling and condensing is also described. It is shown that water requirements are dependent on process design, mine location, and climate, and that generalized assessments that are not site-specific and design-specific are of limited value. It is also shown that the published water requirements for integrated

SNG plants and mine operations in the West may be too high, and that the actual requirements could (depending on location) be half the lowest estimates to date. It is concluded that determination of water requirements for such facilities is particularly important in the Western U.S. where coal is available but water is scarce. The appendix contains representative formulae and data for calculating costs of cooling methods. (See also W78-06302) (Wares-IPA)
W78-06307

TECHNOLOGICAL ECONOMICS APPLIED TO WASTE RECOVERY AND TREATMENT PROCESSES,
Aston Univ., Birmingham (England). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W78-06327

COST MINIMIZATION FOR COAL CONVERSION POLLUTION CONTROL: A MIXED INTEGER PROGRAMMING MODEL,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W78-06359

PROJECTIONS OF ECONOMIC DEVELOPMENT ASSOCIATED WITH COAL-RELATED ACTIVITY IN MONTANA,
Montana State Univ., Missoula. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6D.
W78-06364

CHLORIDES IN THE KRAFT RECOVERY SYSTEM,
Institutet for Vatten- Och Luftvardsforskning, Stockholm (Sweden).
For primary bibliographic entry see Field 5D.
W78-06374

WATER REQUIREMENTS FOR FUTURE ENERGY DEVELOPMENT IN THE WEST: STATE PERSPECTIVES,
EG and G Idaho, Inc., Idaho Falls.
For primary bibliographic entry see Field 6D.
W78-06375

OZONATION OF MAKE-UPWATER FOR SALMONIC FISH REARING FACILITIES,
Idaho Univ., Moscow. Dept. of Bacteriology and Biochemistry.
For primary bibliographic entry see Field 5D.
W78-06579

PROBLEMS WITH REUSE OF VETRNI PAPER MILL EFFLUENTS IN THE PULP MILL CONSIDERING THE CONCENTRATION OF SULFATE IONS (PROBLEMATIKA RECIRKULACIE VOD MEDZI PAPIERNOU A CELULOZKOU VO VETRNI Z HL'ADISKA OBEHU SIRANOVYCH IONOV),
Vyskumny Ustav Papiera a Celulozy, Bratislava (Czechoslovakia).
L. Balhar, P. Buchler, and J. Schmied.
Papir a Celuloza, Vol 32, No 7-8, p 195-198, 1977. 2 fig, 2 tab.

Descriptors: *Water reuse, *Pulp wastes, *Water pollution control, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Foreign countries, Europe, Water conservation, Sulfur compounds, Computer models, Ions, Sulfates, Recycling, Aluminum, Newsprint mills, Sulfite pulp mills, Czechoslovakia.

The Vetrni integrated pulp and paper factory in Czechoslovakia includes sulfite as well as sulfate mills, a groundwood production facility, and a paper mill containing several paper machines and a modern newsprint machine. A study of freshwater usage potential showed that it would be advantageous to reuse the newsprint machine effluent, after mechanical treatment, in the sulfite pulp mill. The only problem might be the contamination of the sulfite pulp mill system, mainly the spent liquor evaporators, with sulfate ions originated in the paper mill. To answer the question about the sulfate ion concentration, a computer simulation of the proposed recycle was carried out. The results showed that the sulfate ion concentration would not reach a dangerous level when the newsprint paper mill effluent is used in the pulp separation section of the sulfite pulp mill. (Trubacek-IPC)
W78-06627

USE OF WARM WATER AFTER COOLING COMPRESSORS AND CONDENSERS (ISPOL'ZOVANIE V PROIZVODSTVE TEPLOI VODY POSLE OKHLAZHDENIYA KOMPRESSOROV I KHOLODIL'NIKOV),
Solikamskii Tsellyulozno-Bumazhnyi Kombinat (USSR).
For primary bibliographic entry see Field 3C.
W78-06638

PLANT CLOSES LOOP ON ITS WASTEWATER TREATMENT.
For primary bibliographic entry see Field 5D.
W78-06641

EVALUATION OF BIRD CHILLER WATER FOR RECYCLING IN GIBLET FLUMES,
Richard B. Russell Agricultural Research Center, Athens, GA.
For primary bibliographic entry see Field 5D.
W78-06644

NON-CLOG WATER DISTRIBUTION NOZZLE,
Ecodyne Corp., Lincolnshire, IL. (Assignee).
J. M. Schwinn.
U.S. Patent No. 4,055,305, 4 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 963, No 4, p 1265, October 25, 1977.

Descriptors: *Patents, *Cooling water, *Water cooling, *Industrial water, *Spraying, Cooling towers, Nozzles, Application equipment, Dispersion.

In some cooling towers liquid to be cooled is pumped up to an open-topped hot water distribution basin extending over most of the upper surface of the tower. Solid objects which fall on the tower collect in such a basin and pass with the liquid being cooled into the nozzles which spray the liquid over the cooling tower fill. To ensure efficient use of all of the fill in a cooling tower, the liquid being cooled should be evenly distributed over the fill. Even distribution of the liquid can be economically achieved by using baffle-type nozzles to spray the hot liquid in essentially circular patterns. Prior art spray nozzles have not been satisfactory because the structure supporting the spray creating baffles, and the baffles themselves, often become clogged by solid objects in the liquid being cooled. Such clogging disrupts the circular spray patterns and thus prevents even distribution of liquid over the fill. It is the object of this invention to provide a clog-free nozzle for spraying hot liquid over the fill in a cooling tower and that creates a circular spray pattern in an unpressurized system by using a single baffle supported by a single arm. The liquid flows through the nozzle solely under the influence of gravity. The spray nozzle is durable, relatively lightweight, corrosion-resistant, and inexpensive. (Sinha-OEIS)
W78-06670

3F. Conservation In Agriculture

ANALYSIS OF PRIORITY WATER RESOURCES PROBLEMS FOR THE SOUTHERN PLAINS REGION,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W78-06207

SOIL, WATER, AND VEGETATION CONDITIONS IN SOUTH TEXAS,
Agricultural Research Service, Weslaco, TX.
For primary bibliographic entry see Field 7B.
W78-06240

EFFECT OF SULFURIC ACID ON AMMONIA VOLATILIZATION UNDER FIELD CONDITIONS,
Arizona Univ., Tucson. Dept. of Soil, Water and Engineering.
For primary bibliographic entry see Field 3C.
W78-06335

METHODS FOR AN INVESTIGATION OF UREA-N LOSS IN ARIZONA AGRICULTURAL WATERS DUE TO UREASE ACTIVITY,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W78-06336

DRIP IRRIGATION TO REVEGETATE MINE WASTES IN AN ARID ENVIRONMENT,
ASARCO, Inc., Tucson, AZ.
For primary bibliographic entry see Field 3B.
W78-06339

EFFICIENT UTILIZATION OF IRRIGATION WATER AND EQUIPMENT. PART I: DRIP AND SPRINKLER IRRIGATION OF CARROTS AND ONIONS. PART II: ANALYSIS OF MULTIPLE PIVOT IRRIGATION ON A DROUGHTY SOIL,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
D. W. DeBoer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 501, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, November 1977. 60 p, 5 fig, 21 tab, 27 ref. OWRT A-043-SDAK(1), 14-31-0001-5042.

Descriptors: Irrigation, *Drip irrigation, *Irrigation efficiency, *Crop response, Application equipment, Water management(Applied), Water utilization, Soil water, Carrots, Onions, *Sprinkler irrigation, *Center pivots, Water demand, Irrigation operation and maintenance, Irrigation systems, Irrigation design, *North Dakota.

Results from a two year drip and sprinkler irrigation study on carrots and onions are reported. The experimental field site was near Brookings, South Dakota on a 45 cm deep Fordville loam soil; one sprinkler and three drip treatments were investigated in the study. For the first year approximately equal gross amounts of irrigation water were supplied to all experimental plots. The carrot and onion sprinkler yields were smaller than the drip yields. Average carrot and onion yields were approximately 105,000 kg ha-1 and 60,000 kg ha-1, respectively. The water management program for the second year resulted in overirrigation on the sprinkler treatment and adequate irrigation on the drip treatment. While crop yields were similar, the drip produce was larger on the average than sprinkler produce, and tended to have fewer culls and splits. A field plot study was conducted to simulate the use of one center pivot irrigation machine on one and/or two adjacent fields. The soil in the ex-

perimental area had a depth of 46 cm and an available moisture storage of 6.1 cm. Corn and alfalfa were the experimental crops. Corn yields were significantly reduced when one irrigation machine was used to irrigate two fields of corn instead of one field; however, alfalfa yields were not reduced. Corn yield, for the situation where the irrigation machine is first used on an alfalfa field and then moved to the corn field in early July, was equal to single field corn yield. The alfalfa yield for the July move situation was more than the dryland yield but less than the full season irrigation yield. An economic feasibility study indicated that one irrigation machine on one field of corn or on two fields of alfalfa was most economical when corn or alfalfa were exclusively grown. When combinations of corn and alfalfa were considered, commodity prices were a dominant factor.
W78-06413

INFLUENCE OF SOIL TYPE, PH, MOISTURE AND TEMPERATURE ON PHYTOTOXICITY AND EFFECTIVENESS OF THE FUNGICIDES OF THE PCNB AND TMTD GROUPS IN THE CONTROL OF ONION SMUT (UROCYSTIS MAGICA PASS.), (IN POLISH),
Szkola Glowna Gospodarstwa Wiejskiego Warsaw (Poland).
J. Kochman, and W. Macias.
Acta Agrobot 27(1), p 85-104, 1974.

Descriptors: *Soil types, Hydrogen ion concentration, Seedlings, Moisture content, *Phytotoxicity, *Pentachloronitrobenzene, *Dissulfide compounds, *Benzene compounds, *Fungicides, Nasienna, *Onion smut, Sulfides, Temperature, Terrafun, Thiuram, Toxicity, Urocystis-magica, Zaprawa, Plant diseases, Plant fungi.

Onion seedlings were sown in a variety of soils, sandy, peat, clay, compost and in a soil of varying pH and another of varying capillary moisture, and their growth was observed before and after the introduction of fungicides at a concentration of 60 kg/ha. Fungicides of the pentachloronitrobenzane group (PCNB), namely, Terrafun 20, Terrafun 75, Brassicol and Liro PCNB-50 were studied, as well as one of the bis(dimethylthiocarbamoyl)-disulfide group (TMTD), namely, Zaprawa Nasienna T (ZNT). All of the PCNB fungicides inhibited plant germination in ali the soils except peat, while ZNT permitted germination of 50-76% of the seedlings compared to controls and in compost permitted growth of 95%. When the seedlings were infected with onion smut (Urocystis magica Pass.) at levels where none of the seedlings grew, ZNT considerably increased plant growth by reducing smut, particularly at pH 6-7 and in compost where it was least phytotoxic. Temperature and moisture content of the soil greatly affected the infectivity of the fungus. Highest infection was observed at 15C and at soil moisture contents below 40% and above 75%. Infectivity was minimal at 25C and at 60% capillary moisture capacity. In all types of soil, the fungicides of the PCNB group were highly phytotoxic, especially at low moisture levels and higher temperatures. The phytotoxicity of ZNT was not much affected by temperature and was less toxic in dry soils. However, all of the fungicides were effective in controlling infection with the smut fungus but ZNT was the least toxic to the onion plant.--Copyright 1977, Biological Abstracts, Inc.
W78-06505

AN EVALUATION OF THE POTENTIAL FOR USING DRAINAGE CONTROL TO REDUCE NITRATE LOSS FROM AGRICULTURAL FIELDS TO SURFACE WATERS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.
W78-06578

MOISTURE DETECTION APPARATUS,
W. G. Lohoff.
U.S. Patent No. 4,055,200, 8 p, 8 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 963, No 4, p 1229, October 25, 1977.

Descriptors: *Patents, *Irrigation, *Soil moisture, *Moisture content, Irrigation efficiency, Soil-water-plant relationships, Water supply, Valves, Application equipment.

The variability and unpredictablity of the amount of water needed by a specific plant is difficult to forecast. Water should be supplied to the plant in response to the plant's need for water and not in response to an arbitrary standard such as time. A soil moisture detector is described for incorporation between a timer controller and an electrical water supply valve. The detector includes a pneumatic diaphragm apparatus whereby a pressure level is maintained or released between a pair of diaphragms in response to a moisture sensing valve buried in the ground. The pneumatic condition of the detector permits the slug of a solenoid valve, responsive to the timing sequence of the timer controller, to open or close a switch for supplying voltage to the water supply valve. (Sinha-OEIS)
W78-06668

AUXILIARY BRAKING MEANS FOR IMPACT ARM SPRINKLERS,
Rain Bird Sprinkler Mfg. Corp., Glendora, CA. (Assignee).
R. L. Munson.
U.S. Patent No. 4,055,304, 6 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 963, No 4, p 1265, October 25, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation efficiency, Irrigation practices, Application equipment, Water delivery.

An impact type rotary sprinkler includes a rotatable body and nozzle, an impact arm which oscillates responsive to the kinetic energy of the fluid discharge stream and a primary spring called an arm spring. The sprinkler is adapted for uniform water distribution over a range of discharge stream kinetic energies in excess of design limits by the provision of a secondary spring. The auxiliary spring is carried on the body of the sprinkler and has a free end placed in the path of arm rotation for engagement with the arm after it has rotated through a predetermined arc. Once the free end of the auxiliary spring has been engaged by the impulse arm further rotation of the arm is restricted by the auxiliary spring in cooperation with the armspring, both springs acting together against the arm to reverse its direction of rotation. (Sinha-OEIS)
W78-06669

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

VALIDATION AND IMPLEMENTATION OF A SIMPLIFIED STREAMFLOW SIMULATOR,
Nebraska Univ., Lincoln. Dept. of Computer Science.
For primary bibliographic entry see Field 2E.
W78-06205

OPTIMAL OPERATION OF A FLOOD CONTROL RESERVOIR,
Iowa State Univ., Ames. Dept. of Civil Engineering.
T. D. Glanville.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 099, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, 1976. 107 p, 18 fig, 1 tab, 28 ref, 2 append. OWRT B-049-IA(1).

Descriptors: *Flood control, *Reservoir operation, *Model studies, *Computer models, Planning, Programs, Cost analysis, *Iowa, *Dynamic programming, *Computer optimization model, *Des Moines River(IA), *Red Rock Reservoir(IA), *Saylorville Reservoir(IA).

Flood control reservoir operating policies which balance both upstream and downstream damage potentials during large magnitude floods are described. The formulation and operation of a dynamic programming optimization model which is used to determine the effects of various operating schemes that limit the damage in certain areas upstream of a flood control structure are detailed. The Red Rock-Saylorville Reservoir System, located on the Des Moines River up-and downstream of Des Moines, Iowa, is analyzed. (Seip-IPA)
W78-06208

FLOOD ROUTING BY THE MUSKINGUM METHOD,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-06211

A MONTHLY WATER BALANCE MODEL INCLUDING DEEP INFILTRATION AND CANAL LOSSES,
Vrije Univ., Brussels (Belgium). Lab. of Hydrology.
For primary bibliographic entry see Field 2A.
W78-06220

HYDROGRAPH SYNTHESIS USING LANDSAT REMOTE SENSING AND THE SCS MODELS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-06236

POTAMOLOGY INVESTIGATION, RELATIONSHIP BETWEEN CALCULATED HYDRAULIC PARAMETERS AND PHYSICAL FEATURES OF THE CHANNEL.
Water and Environment Consultants, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 8B.
W78-06237

POTAMOLOGY INVESTIGATION, A STUDY OF THE SHIFT IN THE STAGE-DISCHARGE RELATIONSHIP OF THE MISSOURI RIVER AT SIOUX CITY, IOWA.
Water and Environment Consultants, Inc., Fort Collins, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 717, Price codes: A03 in paper copy, A01 in microfiche. Prepared by Army Engineer District, Omaha, Nebraska, May 1976. 42 p, 9 fig, 9 tab, 1 ref. Army DACW45-75-D-0003.

Descriptors: *Stage-discharge relations, *Missouri River, *Iowa, *Degradation(Stream), *Channel morphology, Suspended solids, Sediments, Flow, Streamflow, Dams, Control structures, Flow control, Discharge(Water), Water levels, Degradation(Slope), Rivers, Channels, Channel improvement, Geomorphology, Erosion, Hydraulics, Potamology, *Sioux City(Iowa).

Over the past 10 years, the Missouri River has experienced a large downward shift in its stage-discharge relationship at the Sioux City, Iowa, gaging station. The stage for a given discharge, in the range of 10,000 to 40,000 cfs, has decreased 5-8

feet in this time. A study of related data showed that the combined interaction of geologic, hydrologic, geometric, and hydraulic factors influenced this change. The major changes which combined to cause a general degradation in the river reach near Sioux City include a reduction in suspended sediment load, a shortening of the river channel in the area, construction of river training works, and a recent (7 year) increase in the mean yearly flow as well as increased peak flows. The resulting degradation and increase in total channel area below the high bank elevation have lowered the stage for a given discharge at Sioux City. This study illustrated the changes which have occurred in the river since 1950. (Sims-ISWS)
W78-06238

SOIL, WATER, AND VEGETATION CONDITIONS IN SOUTH TEXAS,
Agricultural Research Service, Weslaco, TX.
For primary bibliographic entry see Field 7B.
W78-06240

INTERACTION OF URBAN STORMWATER RUNOFF, CONTROL MEASURES AND RECEIVING WATER RESPONSE,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 5B.
W78-06309

HISTORICAL STREAMFLOW SUMMARY, MANITOBA, TO 1976.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W78-06310

HISTORICAL STREAMFLOW SUMMARY, SASKATCHEWAN, TO 1976.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W78-06311

MAGNITUDE AND FREQUENCY OF FLOODS IN SOUTHERN ONTARIO,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2E.
W78-06312

THE REDISTRIBUTIONAL CONSEQUENCES OF PUBLIC RECREATION PROVISION AT THE POTHOLES RESERVOIR - COLUMBIA BASIN PROJECT, WASHINGTON,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W78-06349

CHARACTERIZATION OF URBAN RUNOFF - NEW YORK,
Cornell Univ., Ithaca, NY. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-06352

BUOYANCY EFFECTS IN THERMALLY STRATIFIED OPEN-CHANNEL FLOW,
Univ., Iowa City. Dept. of Mechanics and Hydraulics.
For primary bibliographic entry see Field 8B.
W78-06371

INFLOW AND WITHDRAWAL CHARACTERISTICS OF STRATIFIED FLUIDS,
Catholic Univ. of America, Washington, DC. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W78-06394

METHODS FOR REFINING SAMPLE ESTIMATES OF THE PARAMETERS OF HYDROLOGIC SERIES,
For primary bibliographic entry see Field 2E.
W78-06403

REGIONAL WORKING FORMULA OF MAXIMUM RUNOFF IN THE SYRIAN ARAB REPUBLIC,
N. I. Maslov.
Soviet Hydrology, Selected Papers, Vol 15, No 2, p 102-105, 1976. 3 fig, 1 tab, 2 ref. Translated from Trudy IV Vsesoyuznogo Gidrologicheskogo S'yezda, Vol 3, p 68-75, 1975.

Descriptors: *Floods, *Maximum probable flood, *Probable maximum precipitation, Rainfall, Precipitation(Atmospheric), Runoff, Foreign countries, Model studies, Foreign research, Mathematical models, Surveys, Watersheds(Basins), Arid lands, Arid climates, Meteorology, Hydrology, *Syrian Arab Republic.

The Syrian Arab Republic (SAR) has an area of 185,000 sq km. In the west it borders on the mediterranean Sea and changes to the Syrian Desert in the east. Most of the country is a plateau, ranging in elevation from 200 to 700 m above sea level, almost void of vegetation. At the present time, there are sufficient data on precipitation, obtained by the Meteorological Service of the SAR, and field observations of surface runoff, performed by Soviet specialists, to develop a sounder unified method for computing maximum runoff with allowance for regional conditions. There are 234 active meteorological stations in the SAR with precipitation observation records from 10 to 43 years. The purpose of this investigation was to establish from questionnaires the maximum flood stages, estimate their empirical probability of being exceeded, and then to compute the maximum discharges from morphometric cross sections and longitudinal channel profiles taken in the field. I was concluded that the parameters of heavy precipitation in regions with a poorly developed precipitation station network can be refined on the basis of data on daily precipitation maxima and monthly precipitation totals. The network of meteorological stations that record these data is denser, as a rule, and the observation period is much longer. It is also necessary to analyze available pluviograph records for shorter time intervals. This will increase the reliability of hydrologic computations considerably. (Sims-ISWS)
W78-06404

THE IMPACT OF STREAM RECONSTRUCTION AND A GABION INSTALLATION ON THE BIOLOGY AND CHEMISTRY OF A TROUT STREAM,
Lehigh Univ., Bethlehem, PA. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-06410

VEGETATION MANIPULATION - A CASE STUDY OF THE PINYON-JUNIPER TYPE,
Utah State Univ., Logan. Coll. of Natural Resources.
For primary bibliographic entry see Field 2I.
W78-06526

APPLICATION OF COMPUTER MODELING FOR CAPACITY STAGING OF DENVER, COLO., WATER-TREATMENT FACILITIES,
Colorado School of Mines, Golden. Dept. of Basic Engineering.
For primary bibliographic entry see Field 5F.
W78-06559

CALIBRATION OF HYDROLOGICAL MODEL USING OPTIMIZATION TECHNIQUE,
Severn-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 2A.
W78-06561

OPTIMAL DESIGN OF WATER DISTRIBUTION NETWORKS,
Rome Univ. (Italy). Ist. di Aerodinamica.
A. Cenedese, and P. Mele.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 104, No. HY2, p 237-247, February 1978. 9 fig, 1 tab, 9 ref.

Descriptors: *Water distribution(Applied), *Optimization, Hydraulics, *Pipes, *Design, *Cost minimization, *Iterative method, Networks, Computer models, Constraints, Economic efficiency, Equations, Systems analysis.

A method for the optimal design of water distribution networks is presented. It defines the least-cost solution for a closed network using standard diameters on the market. It can account for the branches whose diameter values are assigned (existing); the range of velocities in the pipes and of the hydraulic heads can be imposed. Moreover, the desired solution is obtained with acceptable computer time. The basic hydraulic laws and the other constraints are introduced into the objective function to be minimized. Thus, all constraint equations are eliminated, and the problem is to determine the minimum function (even if complex). The solution is found using an iterative method which considers that the most economical distribution system is always an open network. The method has been applied to a complex network with many loops. (Bell-Cornell)
W78-06562

SUITE OF MATHEMATICAL FLOOD PLAIN MODELS,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering.
H. W. Weiss, and D. C. Midgley.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 104, No. HY3, p 361-376, March 1978. 9 fig, 33 ref.

Descriptors: *Flood routing, *Flood damage, *Economics, *Risks, *Damage patterns, Flood plains, Management, *Model studies, Benefit-cost comparisons, Frequency, Flood control, Uncertainty principle, Systems analysis.

Described is a compendium of mathematical models for use in flood plain management. The models make it possible to establish the steady-state water surface profile or to generate for a given flood event the time graphs of flow depth and average flow velocity on elemental areas of the flood plain and thus to determine the depth and duration of inundation, as well as the degree of sediment deposition, erosion, and violence of the floodwaters anywhere on the flood plain. Given the flood frequency distribution, it is possible to establish the frequency distribution of flood damages and thus to compare the economic merits of alternative flood mitigation measures. (Bell-Cornell)
W78-06563

A STOCHASTIC MODEL OF THE OPERATION OF A STREAM-AQUIFER SYSTEM,
New Mexico Inst. of Mining and Technology, Socorro.
E. Z. Flores, A. L. Gutjahr, and L. W. Gelhar.
Water Resources Research, Vol. 14, No. 1, p 30-38, February 1978. 3 fig, 1 tab, 34 ref.

Descriptors: *Reservoir operation, *Stochastic processes, *Linear programming, *Water management(Applied), *Optimization, Aquifers, Streams, Decision making, Effects, Wells, Drawdown, Probability, Chance constraints, Cost minimization, Mathematical models, Operations research, Equations.

A simple lumped parameter stochastic model for optimal water management in a stream-connected aquifer system is examined. The physical system is represented by a linear reservoir model, and a conditional probability approach is used to estimate the effect of parameter variability. A drawdown correction is used to incorporate the local drawdown of the wells and is a crucial part of the model. A management analysis is accomplished by using a linear decision rule to minimize the expected value of the discounted costs with appropriate chance constraints, and the resulting nonlinear optimization problem is solved iteratively using a standard linear programming package. In order to evaluate the limitations of the lumped parameter model in a management context, the results of the management technique are compared with results from Maddock (1974) who used a distributed representation of the aquifer. The conclusions of this analysis indicate that stochastic effects are not very important in arriving at an operating policy but are important in determining the expected cost. (Bell-Cornell)
W78-06566

STRUCTURAL FLOOD CONTROL PLANNING,
Bell Lab., Holmdel, NJ.
M. Ball, W. F. Bialas, and D. P. Loucks.
Water Resources Research, Vol. 14, No. 1, p 62-66, February 1978. 3 fig, 2 tab, 8 ref.

Descriptors: *Flood control, *Structures, *Flood routing, *Optimization, *Branch and bound backtracking, *Alternative planning, *Cost minimization, River basins, Reservoir storage, Design flood, Flood plains, Estimating, Mathematical models, Equations, Systems analysis.

Flood routing methods, together with a branch and bound backtracking optimization routine, are used to evaluate alternative capacities and locations of various flood control structures required to protect a floodplain from a specified design flood. Described is this preliminary planning procedure, and its use for estimating least-cost combinations of flood storage capacities in reservoirs, temporary flood storage basin capacities, levee locations and heights, and increased channel capacities in river basin systems is illustrated. A prime consideration in the development of this method was computational efficiency; it can be altered to estimate the structural flood control plan that maximizes expected annual damage reduction benefits less the total annual cost of flood protection. The model can be extended to include a distribution of floods rather than a single design flood. (Bell-Cornell)
W78-06567

ON LEVEL CROSSINGS AND CYCLES IN DAM PROCESSES,
Utrecht Rijksuniversiteit (Netherlands). Mathematical Inst.
For primary bibliographic entry see Field 8B.
W78-06569

LAND DATA MANAGEMENT SYSTEM FOR RESOURCE PLANNING,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
S. G. Walesh, L. A. Kawatski, and P. J. Clavette.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 103, No WR2, p 177-192, November, 1977. 6 fig, 4 tab, 6 ref.

Descriptors: *Land management, *Land use, *Information retrieval, *Data systems, *Land surveys, Water resources, Natural resources, Graphical methods, Digital computers, Tabulation processes, Urban planning.

Land and water resource planners are increasingly faced with the problem of working with a growing mass of natural resource and man-made features data. A digital computer-based Land Data Management System (Land DMS) intended to resolve this problem by providing an efficient means to store, retrieve, analyze, and display land data is described. 'Land Data' is comprehensive in that it denotes all those types of natural resources and man-made features data having an areal characteristic. A 2.5-acre (1.0 ha) cell is the basic unit in the Land DMS. Five practical applications of Land DMS are described: graphic and tabular display of data; delineation of environmental corridors; formulation of diffuse source pollution abatement alternatives; assembly of input data for hydrologic-hydraulic models; and preparation of report artwork. Systems such as the Land DMS can optimize the use of the available data base and thereby substantially contribute to the quality of the decision making process in land and water resources planning. (Bell-Cornell)
W78-06570

FLOOD MANAGEMENT FOR SMALL URBAN STREAMS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 103, No WR2, p 315-324, November 1977. 3 fig, 6 ref.

Descriptors: *Flood control, *Flood forecasting, *Runoff, *Erosion, *Aesthetics, *Floods, Detention reservoirs, Regulation, Flood plains, Urban development, Streams, *New Jersey, Princeton(NJ).

Experiences in Princeton, New Jersey are used to analyze flood problems of small urban streams, including building in flood plains, increased floods due to urbanization, and accentuated erosion tendencies. A detailed survey and flood analysis were very beneficial, followed by flood plain zoning and a requirement for flood detention storage by developers. Culverts now too small to handle increased floods constitute a defense against erosion also caused by the floods. Reconsideration of criteria for culvert design in such situations would be valuable. Federal programs fall short of meeting the rather complex problems in small urbanizing watersheds. (Bell-Cornell)
W78-06571

A SIMULATION MODEL FOR SCREENING A SYSTEM OF RESERVOIRS FOR ENVIRONMENTAL IMPACT,
MacLaren (James F.) Ltd., Willowdale (Ontario). Water Resources Group.
D. B. Hodgins, P. E. Wisner, and E. A. McBean.
Canadian Journal of Civil Engineering, Vol 4, No 1, p 1-9, March 1977. 9 fig, 1 tab, 11 ref.

Descriptors: *Simulation analysis, *Screening model, *Reservoirs, *Environmental effects, Man-made impoundments, Water quantity, Water quality, Hydrology, *Canada, Operating policy, Systems analysis.

Analysis of the potential impact of development alternatives is becoming increasingly complex with the imposition of more and more constraints, many of which are environmental. As well, restricted planning budgets require that a rapid indentification be made of the most promising alternatives to avoid unnecessary expenditures. A screening model to quickly isolate the most promising alternatives is thus becoming considerably important. Described is a computer model that satisfies these concerns in applications involving a series of reservoirs. The model, with both hydrologic and water quality components, simulates and thereby indicates probable changes in downstream flows, reservoir surface fluctuations, and temperature and dissolved oxygen changes in the reservoirs and streams. Through easily adjusted operating policies, reservoir sizes, etc., the model can rapidly determine the potential impact of alternative possible developments. This information is then available to biologists, wildlife, forestry, and social disciplines as an aid in the determination of environmental impact assessments. A case study application of the model that reflects eastern Canadian conditions is described. (Bell-Cornell)
W78-06576

PROBLEMS ASSOCIATED WITH MAINTENANCE OF CHANNEL CAPACITY BELOW FEDERAL RESERVOIRS IN KANSAS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 2E.
W78-06580

WATER RESOURCES OF THE CLARK FORM BASIN UPSTREAM FROM ST. REGIS, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
A. J. Boettcher, and A. W. Gosling.
Montana Bureau of Mines and Geology, Butte Bulletin 104, 1977. 28 p, 7 fig, 2 plates, 12 tab, 31 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater resources, *Water quality, *Water users, *Montana, Water supply, Irrigation, Municipal water, Water wells, Water yield, Aquifer characteristics, Hydrogeology, Precipitation(Atmospheric), Snowmelt, Base flow, Surface-groundwater relationships, Western Montana, *Clark Fork Basin(Mont).

The water resources of the Clark Fork basin are among Montana's most important assets. About 60,000 acre-feet of ground water and 600,000 acre-feet of surface water are withdrawn from the 10,700 square-mile system annually. Most of the population obtains water from municipal systems, but about 23 percent live in rural areas and depend on individual wells. About 70 percent of the total surface-water outflow is runoff from snowmelt of precipitation, which is most intense from April through July. The rest is ground-water contribution to the streams. Water is used mainly for irrigation, industrial, and municipal purposes. The water quality is good to excellent. Most of the ground water is withdrawn from the Quarternary valley-fill aquifers, which yield as much as 1,000 gallons per minute to wells. The Tertiary sedimentary rocks also yield as much as 1,000 gallons per minute to wells. The consolidated bedrock deposits yield small amounts of water to domestic and stock wells.
W78-06588

TIME-OF-TRAVEL AND DYE-DISPERSION STUDIES OF SELECTED STREAMS AND LAKES IN THE OSWEGO RIVER BASIN, NEW YORK, 1967-75,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06589

TECHNIQUE FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS IN TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
E. E. Schroeder, and B. C. Massey.
Water-Resources Investigations 77-110 (open-file report), 1977. 22 p, 13 fig, 9 ref.

Descriptors: *Flood forecasting, *Flood frequency, *Flood discharge, *Regression analysis, *Texas, Natural flow, Streamflow forecasting, Equations, Analytical techniques, Flood recurrence interval.

Drainage area, slope, and mean annual precipitation were the only factors that were statistically significant at the 95-percent confidence level when the characteristics of the drainage basins were used as independent variables in a multiple-regression flood-frequency analysis of natural, unregulated streams in Texas. The State was divided into six regions on the basis of the distribution of the residuals from a single statewide regression of the 10-year flood. Equations were developed for predicting the magnitude of floods with recurrence intervals of 2, 5, 10, 25, 50, and 100 years in each of the six regions. These equations are applicable to unregulated rural streams with drainage basins ranging in area from 0.3 square mile to about 5,000 square miles in some regions. Regression equations were not developed for several areas, particularly in south Texas, because of the lack of definition of the flood-frequency characteristics. (Woodard-USGS)
W78-06591

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1976.
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06594

WATER RESOURCES DATA FOR MINNESOTA, WATER YEAR 1975.
Geological Survey, St. Paul, MN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06595

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1976--VOLUME 1. ARKANSAS RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06596

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1976--VOLUME 2. RED RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06597

APPLICATION OF A RAINFALL-RUNOFF MODEL IN ESTIMATING FLOOD PEAKS FOR SELECTED SMALL NATURAL DRAINAGE BASINS IN TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
B. C. Massey, and E. E. Schroeder.
Open-file report 77-792, December 1977. 23 p, 2 fig, 4 tab, 13 ref.

Descriptors: *Flood forecasting, *Streamflow forecasting, *Peak discharge, *Model studies, *Texas, Simulation analysis, Small watersheds, Rainfall-runoff relationships, Flood frequency, Regression analysis, Analytical techniques.

A parametric rainfall-runoff simulation model was used to synthesize long-term records of annual peak discharges for small natural drainage basins in Texas. Optimum model-parameter values were determined for each of the 40 basins studied by using short-term rainfall, evaporation, and discharge data. The calibrated model was used in conjunction with long-term records of rainfall and evaporation to synthesize a record of annual peaks for each site. Because the frequency curves of the simulated peaks had flatter slopes than those of the observed peaks, the synthetic frequency curves were adjusted for the loss of variance inherent in the modeling process. (Woodard-USGS)
W78-06602

WATER RESOURCES ALONG THE TAPS ROUTE, ALASKA, 1970-74,
Geological Survey, Anchorage, AK. Water Resources Div.
J. M. Childers, J. W. Nauman, D. R. Kernodle, and P. F. Doyle.
Open-file report 78-137, 1977. 136 p, 24 fig, 8 ref.

Descriptors: *Hydrologic data, *Streamflow, *Water quality, *Alaska, *Pipelines, Hydrographs, Water analysis, Benthos, Invertebrates, Gaging stations, Flow rates, *Trans-Alaska pipeline route, *Pre-construction water data.

The U.S. Geological Survey installed 10 streamgaging and water-quality stations along the trans-Alaska pipeline route (TAPS) starting in 1970. These stations, mostly north of Fairbanks, add to the historical network of gaging stations and provide records of hydrologic conditions along the TAPS route. Selected data from 23 gaging stations along the TAPS route for the period 1970-74 (prior to construction of the pipeline) are compiled in graphic form. The data include annual hydrographs of daily mean or instantaneous values of a standard set of parameters which are indicative of physical, chemical and biological conditions of the streams. The hydrographs facilitate comparisons of data, both in time and between stream sites. Thus, they are a tool for evaluating streamflow characteristics along the TAPS route during the preconstruction period. (Woodard-USGS)
W78-06603

HYDROLOGIC DATA FOR LITTLE ELM CREEK TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06604

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06605

4B. Groundwater Management

ANALYSIS OF PRIORITY WATER RESOURCES PROBLEMS FOR THE SOUTHERN PLAINS REGION,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W78-06207

DETERMINATION OF UNCONFINED AQUIFER PARAMETERS USING PARTIALLY PENETRATING WELLS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soil and Water Engineering.
For primary bibliographic entry see Field 2F.
W78-06209

ANALYTIC SOLUTIONS FOR DRAWDOWNS IN WEDGE-SHAPED ARTESIAN AQUIFERS,
Birmingham Univ. (England). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 2F.
W78-06210

MICROWAVE INTERFERENCE DETECTION OF SUBSURFACE WATER,
Drexel Univ., Philadelphia, PA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-06225

LOW RIVER RUNOFF,
For primary bibliographic entry see Field 2E.
W78-06227

GROUND WATER RECHARGE TO THE AQUIFERS OF NORTHERN SAN LUIS VALLEY, COLORADO: A REMOTE SENSING INVESTIGATION,
Colorado School of Mines, Golden, Dept. of Geology.
For primary bibliographic entry see Field 2F.
W78-06242

A COMPARISON OF ALUMINUM SULFATE AND ACTIVATED CARBON FOR ORGANIC COLOR REMOVAL FROM GROUNDWATERS,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W78-06348

THE EFFECT OF SEEPAGE ON THE DESIGN OF STORM WATER PONDS IN FLORIDA,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-06369

HYDRAULIC FRACTURING OF DRILLED WATER WELLS IN CRYSTALLINE ROCKS OF NEW HAMPSHIRE,
New Hampshire Dept. of Resources and Economic Development, Concord. State Geologists Office.
G. W. Stewart.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 247, Price codes: A09 in paper copy, A01 in microfiche. Completion Report, (1978). 161 p, 66 fig, 22 tab, 32 ref, append. OWRT C-4374(No. 9055)(1).

Descriptors: *Hydraulic fracturing, *Water wells, *New Hampshire, *Crystalline rocks, Drilling, *Logging(Recording), *Borehole geophysics, *Pumping tests, Groundwater resources, *Water yield improvement, Water supply.

During May 1973, hydraulic fracturing methods were used successfully to stimulate the yield of two drilled water wells in crystalline rocks at the Horticultural Farm, University of New Hampshire. This method attempts to reduce the risk of recovering an adequate water supply from drilled water wells in crystalline rocks. Pumping tests began immediately after the fracturing and similar rates and periods of pumping were used in both wells for comparison. The deeper well yielded a minimum of 24 gpm after hydraulic fracturing, an increase of 20 gpm over the yield before fracturing. The 300 foot well was also stimulated by fracturing; from less than 4 gpm to 15 gpm. If the costs of transportation and the elimination of the fine sand as a propping agent could be eliminated or if a central location for the service office could be established in New England, this method of stimulating drilled wells in crystalline rocks might become economically competitive to (1) drilling to greater depths to obtain more water, or (2) drilling another well.
W78-06372

A STOCHASTIC MODEL OF THE OPERATION OF A STREAM-AQUIFER SYSTEM,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 4A.
W78-06566

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1976 TO SPRING 1977,
Geological Survey, Tucson, AZ. Water Resources Div.

For primary bibliographic entry see Field 7C.
W78-06583

SALTWATER INTRUSION IN THE SHALLOW AQUIFER IN PALM BEACH AND MARTIN COUNTIES, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06584

MAP SHOWING GROUND-WATER CONDITIONS IN THE LOWER VERDE RIVER AREA, MARICOPA, YAVAPAI, AND GILA COUNTIES, ARIZONA-1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06585

GROUND-WATER QUALITY NEAR THE WATER TABLE IN SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06586

THE CLINTON STREET-BALLPARK AQUIFER IN BINGHAMTON AND JOHNSON CITY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
A. D. Randall.
New York State Department of Environmental Conservation, Albany Bulletin 73, 1977. 87 p, 19 fig, 8 plates, 10 tab, 58 ref, append.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Urban hydrology, *Water level fluctuations, *Water quality, Water supply, Pumping, Water yield, Drawdown, Groundwater recharge, Hydrogeology, Groundwater movement, Natural recharge, Precipitation(Atmospheric), Streams, Rivers, Artificial recharge, Induced infiltration, *New York, Aquifer management, Binghamton(NY), Johnson City(NY), Susquehanna River basin(NY), *Clinton Street-Ballpark aquifer(NY).

This report describes and evaluates the Clinton Street-Ballpark aquifer that extends from the western part of Binghamton through the central part of Johnson City, New York. The aquifer underlies 3 square miles of urban land in the Susquehanna River Valley and consists chiefly of permeable sand and gravel. Transmissivity generally exceeds 10,000 feet squared per day. Lenses of silt locally restrict water movement. A combination of dry weather and relocation of pumping centers caused water levels to decline as much as 23 feet during the 1960's. These factors and increased use of chemicals for snow removal are thought to be responsible for increases in hardness and chloride concentrations in water from heavily pumped wells. The principal sources of recharge are (1) induced recharge from the Susquehanna and Chenango Rivers at the west and east ends of the aquifer--estimated annual potential is 7.6 billion gallons; (2) precipitation on the aquifer and on thin sand and gravel bordering 85--estimated average annual rate is 22 inches or 1.5 billion gallons; and (3) infiltration from small streams crossing the aquifer-estimated average annual rate is 0.24 billion gallons. Urban land use and ground-water development together seem to have reduced evapotranspiration more than they have reduced recharge. Annual pumpage in 1967 was about 4 billion gallons. (Woodard-USGS)
W78-06587

WATER RESOURCES OF THE CLARK FORM BASIN UPSTREAM FROM ST. REGIS, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06588

APPRAISAL OF THE WATER RESOURCES OF DEATH VALLEY, CALIFORNIA-NEVADA,
Geological Survey, Menlo Park, CA. Water Resources Div.
G. A. Miller.
Open-file report 77-728, December 1977. 68 p, 9 fig, 5 tab, 54 ref.

Descriptors: *Groundwater resources, *Deserts, *California, *Nevada, *Water quality, Groundwater availability, Projections, Springs, Water yield, Test wells, Water analysis, Chemical analysis, *Death Valley National Monument(Calif Nev).

The hydrologic system in Death Valley is probably in a steady-state condition--that is, recharge and discharge are equal, and net changes in the quantity of ground water in storage are not occurring. Recharge to ground water in the valley is derived from interbasin underflow and from local precipitation. The two sources may be of the same magnitude. Ground water beneath the valley moves toward the lowest area, a 200-square-mile saltpan, much of which is underlain by rock salt and other saline minerals, probably to depths of hundreds of feet or even more than 1,000 feet. Some water discharges from the saltpan by evaportranspiration. Water beneath the valley floor, excluding the saltpan, typically contains between 3,000 and 5,000 milligrams per liter of dissolved solids. Water from most springs and seeps in the mountains contains a few hundred to several hundred milligrams per liter of dissolved solids. Water from large springs that probably discharge from interbasin flow systems typically contains between 500 and 1,000 milligrams per liter dissolved solids. Present sites of intensive use by man are supplied by springs, with the exception of the Stovepipe Wells Hotel area. Potential sources of supply for this area include (1) Emigrant Spring area, (2) Cottonwood Spring, and (3) northern Mesquite Flat. (Woodard-USGS)
W78-06593

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1976.
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06594

WATER RESOURCES DATA FOR MINNESOTA, WATER YEAR 1975.
Geological Survey, St. Paul, MN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06595

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1976--VOLUME 1. ARKANSAS RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06596

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1976--VOLUME 2. RED RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06597

GROUND-WATER DATA FOR MICHIGAN, 1976,
Geological Survey, Lansing, MI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06598

EFFECTIVENESS OF PILOT CONNECTOR WELL IN ARTIFICIAL RECHARGE OF THE FLORIDAN AQUIFER, WESTERN ORANGE COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
F. A. Watkins, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 054, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Investigations 77-112, November 1977. 28 p, 11 fig, 2 tab, 8 ref.

Descriptors: *Artificial recharge, *Groundwater recharge, *Aquifer characteristics, *Water management(Applied), *Florida, Water quality, Water transfer, Aquifers, Water wells, Hydrogeology, Evaluation, Floridan aquifer(Fla), *Pilot connector well, *Western Orange County(Fla).

A connector well pilot installation, in continuous operation in western Orange County since December 4, 1970, was transferring water from the lower of two shallow sand aquifers to the Floridan aquifer at a rate of 13 gallons per minute when measured on September 23, 1971. The recharge water is untreated and analyses show it to be chemically and physically compatible with the water in the Floridan aquifer. The temperatures of the recharging and receiving waters were identical, 23 deg C. The transfer of water from the lower sand aquifer to the Floridan aquifer caused only a small buildup of artesian pressure in the Floridan aquifer but it lowered the artesian head 4 feet in the lower sand aquifer near the well which supplied the recharge water. Water levels in the upper sand aquifer were not affected, probably because of the low permeability of an intervening hardpan layer. However, after six auger holes back-filled with sand connected the two sand aquifers on April 5, 1972, a rise of water levels in the lower sand aquifer was noted. The principal chemical and physical effects on the water in the Floridan aquifer were a general improvement in chemical quality and an increase in color. The color may decrease as more water moves through the sand aquifer and the material responsible for the high color is removed by flushing. (Woodard-USGS)
W78-06599

DIGITAL-MODEL EVALUATION OF THE GROUND-WATER RESOURCES IN THE OCOTILLO-COYOTE WELLS BASIN, IMPERIAL COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-06600

DIGITAL COMPUTER SIMULATION MODEL OF THE ENGLISHTOWN AQUIFER IN THE NORTHERN COASTAL PLAIN OF NEW JERSEY,
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-06601

APPRAISAL OF GROUND-WATER CONDITIONS IN MERCED, CALIFORNIA, AND VICINITY,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-06606

PEATLAND AND WATER IN THE NORTHERN LAKE STATES,
North Central Forest Experiment Station, St. Paul, MN.
For primary bibliographic entry see Field 4D.
W78-06639

GROUND WATER DIFFERENCES ON PINE AND HARDWOOD FORESTS OF THE UDELL EXPERIMENTAL FOREST IN MICHIGAN,
North Central Forest Experiment Station, St. Paul, MN.
For primary bibliographic entry see Field 2F.
W78-06640

4C. Effects On Water Of Man's Non-Water Activities

ENERGY RELATED ACTIVITIES AND AN ASSESSMENT OF THE WATER RESOURCE MANAGEMENT ALTERNATIVES IN SOUTH LOUISIANA,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 6B.
W78-06201

THE 1976 DROUGHT IN FRANCE: CLIMATOLOGICAL ASPECTS AND CONSEQUENCES (LA SECHERESSE 1976 EN FRANCE: ASPECTS LIMATOLOGIQUES ET CONSEQUENCES),
Direction de la Meteorologie, Boulogne-Billancourt (France).
For primary bibliographic entry see Field 2B.
W78-06221

DEVELOPMENT OF A HYDROPHOBIC SUBSTANCE TO MITIGATE PAVEMENT ICE ADHESION,
Ball Bros. Research Corp., Boulder, CO.
G. H. Ahlborn, and H. C. Poehlmann, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 653, Price codes: A10 in paper copy, A01 in microfiche. Report EPA-600/2-76-242, December 1976. 218 p, 28 fig, 25 tab, 71 ref, 4 append. EPA 68-03-0359.

Descriptors: *Highways, *Paving, *Ice, *Deicers, *Water pollution control, Materials, Materials testing, On-site investigations, Laboratory tests, Environmental effects, Water pollution, Salts, Coatings, Economics, Costs, Evaluation, Ice control, Ice breakup, Hydrophobic materials, Pavement deicers.

This research was undertaken to investigate the feasibility of the use of hydrophobic substances on highway and bridge deck surfaces to reduce ice adhesion. Such a coating could reduce or eliminate the possibility of pollution of groundwater by currently used deicing chemicals and the multi-billion dollar yearly cost of automotive frame, bridge deck, and highway surface deterioration caused by such chemicals. The research program herein described was conducted in four phases and, in addition to the basic technical evaluation, included consideration of all aspects of prospective coatings such as cost effectiveness, pollution potential, application techniques, effective life, and detailed characterization of the formulations and chemicals employed. The feasibility of this approach was demonstrated with three coatings showing practical promise. Specific recommendations were presented to optimize the concepts developed in this program. (Sims-ISWS)
W78-06241

DESERTIFICATION IN THE UNITED STATES,
International Center for Arid and Srmi-Arid Lands Studies, Lubbock, TX.
For primary bibliographic entry see Field 4D.
W78-06333

EFFECTS OF GULLY PLUGS AND CONTOUR FURROWS ON EROSION AND SEDIMENTATION IN CISCO BASIN, UTAH,
Utah State Univ., Logan. Coll. of Natural Resources.
For primary bibliographic entry see Field 4D.
W78-06334

FISHERIES PROBLEMS ASSOCIATED WITH THE DEVELOPMENT OF THE LOWER COLORADO RIVER,
For primary bibliographic entry see Field 6G.
W78-06341

CONTROL OF DITCH EROSION USING FIBERGLASS ROVING (TYPE B STUDY),
California State Dept. of Transportation, Sacramento. Transportation Lab.
For primary bibliographic entry see Field 4D.
W78-06381

URBANIZATION: HYDROLOGIC-HYDRAULIC-DAMAGE EFFECTS,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
S. G. Walesh, and R. M. Videkovich.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY2, Proceedings Paper 13553, p 141-155, February 1978. 8 fig, 1 tab, 4 ref, 1 append.

Descriptors: Urbanization, *Wisconsin, *Flood damage, *Flood discharge, *Model studies, Mathematical models, Flood plains, Flood plain zoning, Flood stages, Flood peak, Channel improvement, Channeling, Channels, Rivers, Runoff, Economics, Systems analysis, Hydrology, Hydraulics, *Urbanization effects, Urban development.

An effective conceptual approach to determining the consequences of land-use changes on flood flows, stages, and damage involves partitioning the watershed land surface into floodland and nonfloodland areas. A hydrologic-hydraulic-flood damage model consisting of a combination of continuous process and steady-state computer programs was presented as a potentially effective analytic tool. The model was used to assess the impact of seven combinations of floodland and nonfloodland development on a 136-sq mile (352-sq km) urbanizing watershed in southeastern Wisconsin. Under conditions of complete urbanization of the presently undeveloped floodland and nonfloodland areas in the watershed, the 100-yr flood discharge may be expected to increase, relative to existing conditions, by a median factor of 1.9; the predicted median increase in 100-yr flood stages is 4.5 ft (1.4-m); and average annual flood damage for four flood-prone reaches may be expected to increase by factors of 2.4 to 8.5. (Sims-ISWS)
W78-06385

PARALLEL CASCADES MODEL FOR URBAN WATERSHEDS,
Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Civil Engineering.
For primary bibliographic entry see Field 4D.
W78-06386

ESTIMATES OF NONPOINT SOURCE POLLUTION BY MATHEMATICAL MODELING,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-06405

ECONOMIC EVALUATION OF ALTERNATIVE USES OF RIVERS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 6B.
W78-06552

A SURVEY AND ANALYSIS OF RECREATIONAL AND LIVESTOCK IMPACT ON THE RIPARIAN ZONE OF THE RIO GRANDE IN BIG BEND NATIONAL PARK,
Texas Agricultural Experiment Station, College Station.
For primary bibliographic entry see Field 6B.
W78-06554

SIMULATION MODELING AS A TOOL FOR MANAGING RIVER RECREATION,
Montana Univ., Missoula. School of Forestry.
For primary bibliographic entry see Field 6B.
W78-06555

A MARKOV-BASED LINEAR PROGRAMMING MODEL OF TRAVEL IN THE BOUNDARY WATERS CANOE AREA,
Northwestern Univ., Evanston, IL. Technological Inst.
For primary bibliographic entry see Field 6B.
W78-06556

CAMPSITE CHOICE BEHAVIOR IN THE RIVER SETTING: A PILOT STUDY ON THE ROGUE RIVER, OREGON,
Victoria Univ. (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 6B.
W78-06557

MANAGING WILDERNESS TRAVEL: A MARKOV-BASED LINEAR PROGRAMMING MODEL,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-06564

QUANTITATIVE ASSESSMENT OF NATURAL VALUES IN BENEFIT-COST ANALYSIS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 6B.
W78-06572

IMPACT OF POTENTIAL PHOSPHATE MINING ON THE HYDROLOGY OF OSCEOLA NATIONAL FOREST, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06590

THE MACROPHYTE VEGETATION OF THE DANUBE WATER-BODIES IN BULGARIA AND ITS CHANGE UNDER THE EFFECT OF HUMANS AND CONSERVATION, (IN RUSSIAN),
Bulgarian Academy of Sciences, Sofia. Inst. of Botany.
For primary bibliographic entry see Field 2I.
W78-06675

4D. Watershed Protection

EROSION AND SEDIMENT CONTROL AUDIOVISUAL TRAINING PROGRAM, WORKBOOK,
Hittman Associates, Inc., Columbia, MD. Environmental and Geosciences Dept.
T. R. Mills, M. A. Nawrocki, G. R. Squire, H. T. Hopkins, and M. L. Clar.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 471, Price codes: A16 in paper copy, A01 in microfiche. Report No. EPA-600/8-76-001-b, June 1976. 350 p. EPA S-800854.

Descriptors: *Erosion control, *Sediment control, Education, *Water quality control, Erosion, Sedimentation, Sediments, Construction, Runoff, Precipitation(Atmospheric), Soil stabilization, Vegetation, Vegetation establishment, Rainfall-runoff relationships, Hydrology, Training, Publications.

A series of technical presentations and a certification plan for erosion and sediment control specialists were presented. Thirteen lessons complete with visual aids, student handouts and, audiovisual handouts consisting of slides, videotape and tape narration, workbooks and instructor's manuals, were developed. These materials were designed to provide an effective education program for qualifying construction personnel and others to pass a certification examination. The list of the lessons was as follows: (1) Goals, Objectives and Principles of Erosion and Sediment Control; (2) Soils; (3) Rainfall-Runoff Relationships; (4) Erosion and Sedimentation; (5) Plant Materials; (6) Control of Runoff During Construction; (7) Vegetative Soil Stabilization; (8) Stream Erosion Control; (9) Temporary Soil Stabilization; (10) Control of Sediment Generated on Construction Sites; (11) Erosion and Sediment Control Planning; (12) Wooded Site Development; and (13) Foreman-Inspector Responsibilities. (See also W77-012815) (Sims-ISWS)
W78-06228

AOIPS WATER RESOURCES DATA MANAGEMENT SYSTEM,
Earth Satellite Corp., Washington, DC.
For primary bibliographic entry see Field 7C.
W78-06239

DESIGNING FOR BANK EROSION CONTROL WITH VEGETATION,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-06249

RUNOFF FROM A PASTURED WATERSHED IN LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-06332

DESERTIFICATION IN THE UNITED STATES,
International Center for Arid and Srmi-Arid Lands Studies, Lubbock, TX.
H. E. Dregne.
Nature and Resources, Vol. 13, No. 2, p 10-13, April-June, 1977.

Descriptors: *Deserts, *Deterioration, *Droughts, Desert plants, *Salinity, *Wind erosion, Ranges, Arid lands, Semiarid climates, Grasslands, Grazing, Sagebrush, Vegetation establishment, Erosion, Mesquite, New Mexico, Arizona, Texas, Range management, Irrigated land, *Desertification.

Desertification is a process of land degradation that is the result of an often complex interaction among people, plants, animals, land and climate. Three instances of widespread desertification in the United States during the past one hundred years are described: (1) overgrazing in the desert grasslands, (2) salinization of irrigated lands, and (3) wind erosion in the Great Plains during the protracted drought of the 1940's. The overgrazing resulted in severe erosion. Salinization and waterlogging began to affect large areas shortly after a rapid expansion of irrigation began in the arid west at the end of the 19th century. The problems of Colorado River project storage and increasing salinization are discussed. The lack of resilience in arid lands makes it essential that signs of desertification be recognized before degradation has assumed major proportions. (Jamail-Arizona)
W78-06333

EFFECTS OF GULLY PLUGS AND CONTOUR FURROWS ON EROSION AND SEDIMENTATION IN CISCO BASIN, UTAH,
Utah State Univ., Logan. Coll. of Natural Resources.
G. E. Gifford, D. B. Thomas, and G. B. Colthart.
Journal of Range Management Vol. 30, No. 4, p 290-292, July 1977. 2 fig, 2 tab, 8 ref.

Descriptors: *Erosion control, *Sedimentation, *Surface runoff, Gully erosion, Watershed management, Basins, Soil stabilization, *Utah, Colorado River Basin, Contour furrows, Gully plugs, Cisco Basin(Utah).

The effects of contour furrows and gully plugs on erosion and sedimentation within the Cisco Basin, Utah, were evaluated. Soils studied were less than 10 cm deep and had developed from Mancos shale and sandstone. When combined, contour furrows and gully plugs held all runoff and sediment. Contour furrows alone were only able to hold a portion of the runoff and sediment. Expected life of the contour furrows ranges from 6 to 12 years, while that of the gully plugs is from 14 to 33 years. (Castricone-Arizona)
W78-06334

CLIMATIC AND ECOLOGICAL ASPECTS OF DESERTIFICATION,
New South Wales Univ. (Australia). School of Geography.
For primary bibliographic entry see Field 2B.
W78-06338

A REVIEW OF THE CORPS OF ENGINEERS' DRAFT ENVIRONMENTAL IMPACT ON THE FIRE ISLAND INLET TO MONTAUK POINT, NEW YORK, BEACH EROSION CONTROL AND HURRICANE PROTECTION PROJECT,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
E. Duvernoy, and D. Mackay.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 363, Price codes: A04 in paper copy, A01 in microfiche. February, 1977. 65 p, 6 fig, 13 ref, 7 append. OWRT A-056-NY(3).

Descriptors: *Environmental effects, *Reviews, *Beach erosion, *Hurricanes, Evaluation, Communication, Planning, Estimated benefits, Engineering, Environmental effects, *Montauk(NY), *Environmental Impact Statement, Public interest.

The EIS, prepared by the New York District, Army Corps of Engineers, on the Fire Island Inlet to Montauk Point, New York, Beach Erosion and Hurricane Protection project (BEHUR), is reviewed; facts and judgments are examined, and an evaluation is made. Corps regulations define a planning process for civil works projects including environmental impact statements and interaction between engineering studies. However, basic information and engineering analyses needed to prepare a complete EIS were either unavailable or outdated during preparation, the result is an incomplete analysis of the proposed project and its reasonable alternatives. Some information included in the EIS is inapplicable, misleading, or missing. Conclusions indicate that public interest groups should request additional engineering and environmental analyses of the BEHUR project before the Corps makes a final decision on it and prior to any additional project construction. The appendices contain information on review chronology, Corps of Engineers and other relevant regulations, Corps of Engineers organization, scope of work, how to read an EIS, and parameters of impact. (Wares-IPA)
W78-06368

CONTROL OF DITCH EROSION USING FIBERGLASS ROVING (TYPE B STUDY),
California State Dept. of Transportation, Sacramento. Transportation Lab.
M. E. Nolan, M. M. Hatano, R. B. Howell, and E. C. Shirley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 914, Price codes: A04 in paper copy, A01 in microfiche. Report FHWA-CA-76-41, Prepared for Federal Highway Administration, Washington, D.C., July 1976. 52 p, 48 fig, 2 ref, 4 append. FHWA F-5-16.

Descriptors: *Erosion control, *Highways, *California, *Vegetation establishment, Soils, Vegetation, Grasses, On-site investigations, Ditches, Drainage, Erosion, Fiberglass, Fiberglass roving, Ditch erosion, Drainage ditches.

The use of fiberglass roving with vegetation for erosion control in drainage ditches is demonstrated. Three sites in California were treated which had various soil types and different climatological conditions. The test sites were monitored with photographs, field observations, and precipitation measurements during the period Fall 1975 to Spring 1976. The fiberglass roving with vegetation was effective in reducing erosion at all three locations. Grasses planted prior to treatment emerged through the fiberglass mat with little or no difficulty. The treatment cost varied from $1.13 to $2.27 per square yard. This study was a follow-up to a study that used fiberglass roving for erosion control at Ponderosa Road Interchange and Highway 50 during the winter of 1973-1974. (Sims-ISWS)
W78-06381

PARALLEL CASCADES MODEL FOR URBAN WATERSHEDS,
Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Civil Engineering.
M. H. Diskin, S. Ince, and K. Oben-Nyarko.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY2, Proceedings Paper 13569, p 261-276, February 1978. 10 fig, 3 tab, 10 ref, 2 append.

Descriptors: *Hydrographs, *Arizona, *Hyetographs, *Urban runoff, *Model studies, Mathematical models, Rainfall, Runoff, Watersheds(Basins), Urbanization, Surface runoff, Reservoirs, Drainage, Flood protection, Hydrology, Urban development.

The conversion of rainfall to surface runoff in urbanized watersheds was represented by a model composed of three main elements. The first element receives the total rainfall hyetograph as input and produces two rainfall excess hyetographs as output. These are used as inputs to the other two elements which are in parallel. The two elements, representing the impervious and the pervious portions of the watershed, were taken to be composed of cascades of linear reservoirs. The elements produce as their outputs two hydrographs that are added to produce the direct surface runoff hydrograph of the watershed. The first element of the model is nonlinear, but the other two are linear. The model, viewed as one unit converting total rainfall to runoff, is nonlinear. Data from a semi-arid urban watershed in Arizona were used to demonstrate the use of the model. (Sims-ISWS)
W78-06386

USING TOPOGRAPHIC CHARACTERISTICS TO PREDICT TOTAL SOLUTE CONCENTRATIONS IN STREAMS DRAINING SMALL

FORESTED WATERSHEDS IN WESTERN MONTANA,
Montana Univ., Missoula.
For primary bibliographic entry see Field 2K.
W78-06407

SOIL EROSION AND DUST CONTROL ON ARIZONA HIGHWAYS, PART II, LABORATORY TESTING PROGRAM,
Arizona Univ., Tucson. Dept. of Civil Engineering.
H. A. Sultan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 601, Price codes: A07 in paper copy, A01 in microfiche. Report ADOT-RS-10-141-II, Prepared for Federal Highway Administration, Washington, D.C., October 1974. 146 p, 14 fig, 9 tab, 9 ref, 3 append.

Descriptors: *Erosion, *Arizona, *Erosion control, *Soil stability, *Laboratory tests, Soil erosion, Wind erosion, Erosion rates, Dusts, Highways, Construction, Soils, Winds, Simulated rainfall, Rainfall simulators, Traffic erosion, Dust control.

Forty-six commercially available chemicals were tested in this study. Laboratory testing included subjecting specimens of a dune sand, treated with spray-on chemicals, to simulated wind velocities up to 90 mph. Specimens of compacted granitic soil, treated with either a spray-on or a mixed-in application of the chemicals, were subjected to simulated traffic abrasive forces under simulated tire pressures up to 60 psi. Selected chemical treatments were subjected to various environmental-durability conditions before testing. Durability conditions included freeze-thaw cycles, wet-dry cycles, rainfall-dry cycles, and variation of curing temperatures. Based upon the results of this laboratory testing phase, several chemical stabilizers were selected for applications in a large-scale field testing program. (See also W78-01658 and W78-06525) (Sims-ISWS)
W78-06524

SOIL EROSION AND DUST CONTROL ON ARIZONA HIGHWAYS, PART III, PROGRESS REPORT-FIELD TESTING PROGRAM,
Arizona Univ., Tucson. Dept. of Civil Engineering.
H. A. Sultan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 602, Price codes: A04 in paper copy, A01 in microfiche. Report ADOT-RS-10-141-III, Prepared for Federal Highway Administration, Washington, D.C., October 1974. 47 p, 13 fig, 4 tab, 6 ref, 2 append.

Descriptors: *Erosion, *Arizona, *Erosion control, *Soil stability, *On-site investigations, Soil erosion, Wind erosion, Erosion rates, Dusts, Highways, Construction, Soils, Winds, Chemicals, Dust control, Chemical stabilization, Traffic erosion, Dust collection.

Several chemical stabilizers were selected for use in a large-scale field application, based on a laboratory testing program. Spray-on application of chemicals to control dust and wind erosion on untrafficable areas was made using 11 chemicals. Five chemicals were used on an unpaved road using a spray-on application to control erosion and dust behind traffic. Three chemicals also were used on the unpaved road using a mixed-in application. Methods of field application were given. Details on monitoring techniques, including HiVol dust collection, dust fall collection in cups, and extraction tests, were discussed. Preliminary observations comparing the chemical applications among themselves and as compared to control sections, where water was used, were given. Evaluation will continue for approximately 12 months more. (See also W78-01658 and W78-06524) (Sims-ISWS)
W78-06525

VEGETATION MANIPULATION - A CASE STUDY OF THE PINYON-JUNIPER TYPE,
Utah State Univ., Logan. Coll. of Natural Resources.
For primary bibliographic entry see Field 2I.
W78-06526

FLOOD MANAGEMENT FOR SMALL URBAN STREAMS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 4A.
W78-06571

ESTABLISHING LOCAL WATER QUALITY MANAGEMENT PRIORITIES,
Washington Univ., St. Louis, MO. Dept. of Technology and Human Affairs.
For primary bibliographic entry see Field 5G.
W78-06573

HYDROLOGIC DATA FOR LITTLE ELM CREEK TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06604

PEATLAND AND WATER IN THE NORTHERN LAKE STATES,
North Central Forest Experiment Station, St. Paul, MN.
D. H. Boelter, and E. S. Verry.
U.S. Department of Agriculture, Forest Service, General Technical Report NC-31, 24 p. 1977. 17 fig, 63 ref, 6 tab.

Descriptors: *Bogs, *Fen, *Great Lakes Region, *Water quality, Hydrology, Organic soils, Water chemistry, Water pollution sources, Streamflow, Precipitation(Atmospheric), Water sources, Nutrients, Rain, Snow, Dusts, Soils, Watersheds(Basins), Color, Groundwater, Mosses, Forest watersheds, Water pollution effects, Water pollution, Water chemistry.

The North Central Forest Experiment Station expanded its watershed research program in 1960 to include basic peatland studies. This report reviews and summarizes basic principles developed from these studies of peatland hydrology, organic soil characteristics, and streamflow chemistry. Peatland is broadly classed into two groups: ombrotrophic (ion-poor) peatland (bog) receives precipitation as its primary water source; minerotrophic (ion-rich) peatland (fen) receives large groundwater supplies as well as precipitation. Contrary to popular belief, neither bogs nor fens maintain an even distribution of annual streamflow. The water chemistry of streams draining peatland depends primarily on water source. Nutrients in rain, snow, and dust, modified by organic soils and spagnum moss, play a major role in the composition of on-site water in ombrotrophic peatland, but the do not greatly affect the ionic compositon of streams draining large areas of land. The water composition of streams draining minerotrophic peatland is primarily determined by the solution of groundwater aquifer and overburden parent materials. The downstream influence of peatland in large watersheds is only seen in color values and perhaps some organically derived anions. Concentrations of these materials decrease with distance from the peatland. (Witt-IPC)
W78-06639

WATER EROSION,
Agricultural Research Service, Lafayette, IN.
W. C. Moldenhauer.
Agricultural Research Service Publications, No. 57, p 47-51, October 1977. 21 ref.

Descriptors: *Soil erosion, *Erosion control, *Sediment transport, *Soil conservation, *Water pollution control, *Cultivation, Mulching, Erosion, Pollution abatement, Model studies, Forecasting, Planning, Contour farming, Crop production, Runoff, Agricultural runoff, Reviews, Research priorities, Universal Soil Loss Equation(USLE).

A brief review of past and present research on soil erosion control includes a discussion of research needs and approaches, expected benefits, and the potential for a predictive model. Some four billion tons of sediment annually enter surface waters in the United States according to a 1967 estimate, compared with three billion tons 30 years earlier. The first soil erosion research plots were established in 1917. Beginning in 1928 research stations were created to monitor precipitation, runoff, and soil loss; most have now been discontinued. In recent years most research has been conducted with rain simulators, and deals with erosion control aspects of surface residue tillage. Methods for prediction of soil and water loss from cropping systems have been successfully developed, including the Universal Soil-Loss Equation. Seeded backslope terrace experiments were initiated in Iowa in 1964-65. Surface residue tillage, the best method for combined wind and water erosion control, nevertheless gives only limited protection. On long or steep slopes runoff may undercut mulch or carry it away, with resulting high soil erosion. Research is needed on tillage-mulch-soil interrelationships to design a tilled zone for minimum runoff. Erosion control could eliminate pollution of surface waters by phosphorus-laden sediment. (Lynch-Wisconsin)
W78-06679

NUTRIENT LOSS RESEARCH,
Agricultural Research Service, Columbia, MO.
R. E. Burwell.
Agricultural Research Service Publications, No. 57, p 28-34, October 1977. 21 ref.

Descriptors: *Nutrients, *Soil erosion, *Sediment transport, *Water pollution control, *Erosion control, Path of pollutants, Model studies, Reviews, Fertilizers, Cultivation, Contour farming, Nitrogen, Phosphorus, Runoff, Agricultural runoff, Research priorities, Nutrient flux, Percolation, Permeability.

A review of recent investigations of nutrient loss covers research needs and approaches, expected benefits, and requisites for developing a chemical transport model are discussed. Nutrient research in the last decade has reemphasized the need to control erosion from agricultural land because sediment constitutes a major transport agent of nitrogen and phosphorus. Research has also shown that soluble nitrogen movement is closely related to the hydraulic characteristics of soils; amounts of soluble nitrogen lost in surface runoff and concentration levels have been low for moderately permeable soils, but high in slowly permeable soils such as claypans. When nitrogen fertilizers are applied at recommended rates, little movement of nitrate nitrogen has been noted below the rooting depth for moderately and slowly permeable soils. Cropping practices which provide good soil cover during the critical erosion period greatly reduce soil erosion and associated nitrogen and phosphorus losses. Terracing is an effective control measure, but contouring alone is not sufficient. Research is needed to characterize effects of tillage-induced physical parameters on soil chemistry and biology as they influence nitrogen mineraliztion and denitrification transformations. Little is known of the effects of tillage on soil insects and crop diseases. A potential benefit of nutrient loss research would be improved use efficiency of fertilizer. (Lynch-Wisconsin)
W78-06689

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

THE USE OF REMOTE SENSING TECHNIQUES FOR DETECTION AND IDENTIFICATION OF POLLUTANT DISCHARGES,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
L. E. Link, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 727, Price codes: A13 in paper copy, A01 in microfiche. Miscellaneous Paper M-73-11, August 1973. 287 p, 29 fig, 65 tab, 34 plate, 49 ref, 1 append.

Descriptors: *Remote sensing, *Pollutant identification, *Computer models, Model studies, Mathematical models, Water quality, River basins, Water pollution, Photography, *Pollutant discharge.

The purpose of this study was to evaluate photographic remote sensing techniques for detecting and identifying pollutant discharges. A number of investigations were conducted to examine the utility of remote sensing techniques for application to water quality problems. These studies were largely qualitative, but, however, they showed that photographic remote sensing techniques have considerable potential in this area. A more definitive evaluation of this potential awaits a quantitative evaluation scheme. This study consisted of (1) the development of a computerized remote sensing simulation model to provide a quantitative, systematic means to rapidly assess the capabilities of photographic remote sensing techniques for application to specific problems; and (2) the use of the remote sensing simulation model to evaluate the utility of these techniques for the detection and identification of pollutant discharge. The remote sensing simulation model included mathematical relations that describe atomspheric attenuation of electromagnetic (EM) radiation, reflection of EM radiation from materials, and the interaction of EM radiation with photographic remote sensing systems. The model provided a means of determining if photographic remote sensors are applicable to a specific problem and, if so, which sensors have the most potential. Spectral reflectance curves for pollutants and water bodies were obtained from the literature and used as inputs to the remote sensing techniques for detection and identification of pollutant discharges. The results of this study indicated that selected photographic remote sensing techniques were theoretically capable of detecting pollutant discharges for each of the pollutant types used in this study. In addition, the feasibility of using photographic remote sensing techniques for identifying pollutant types from among a limited number of possible pollutants was established. (Froehlich-ISWS)
W78-06230

ANALYTICAL QUALITY ASSURANCE FOR TRACE ORGANICS ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY,
Environmental Monitoring and Support Lab., Cincinnati, OH.
J. W. Eichelberger, W. M. Middleton, and W. L. Budde.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 823, Price codes: A02 in paper copy, A01 in microfiche. Report No EPA - 600/4-75-007, September, 1975. 12 p, 4 fig, 2 tab, 7 ref.

Descriptors: *Potable water, *Mass spectrometry, *Gas chromatography, *Analytical techniques, *Pollutant identification, Water quality, Liquid-liquid extraction.

The application of analytical quality assurance (AQA) concepts to the qualitative analysis of drinking water samples for trace organics is described. The concentration isolation, and identification procedures used were liquid-liquid extraction and gas chromatography-mass spectrometry (GC/MS). Some of the analytical concepts are applicable to other methods of analysis including: (1) the entrainment of volatiles in an inert gas stream followed by trapping and GC/MS, and (2) carbon or resin adsorption, extraction, and GC/MS. The data used to illustrate the AQA were obtained from five drinking water samples taken during January and February 1975 and collected from Miami, Seattle, Philadelphia, Cincinnati, and Ottumwa, Iowa. Emphasis was placed on pollutant identification rather than on concentration. The guidelines based on spectrum similarity and the quality of the ions found in the measured mass spectrum are a reasonable basis for evaluating the reliability of an identification. (Seip-IPA)
W78-06267

AEROSOL PRODUCTION BY WASTE WATER SPRAY NOZZLES,
Brookhaven National Lab., Upton, NY.
G. S. Raynor.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL-20246, Price codes: A03 in paper copy, A01 in microfiche. Report BNL-20246, (1975). Presented at the Second National Conference on Complete WateReuse, Chicago, IL, May 4-8, 1975. 27 p, 12 fig, 6 ref.

Descriptors: *Aerosols, *Air pollution, *Spraying, *Irrigation, *Sewage disposal, Tracers, Analytical techniques, *Waste water irrigation, *Land application, *Uranine, Sodium fluorescein.

The size distribution and concentration of aerosol-producing droplets, generated by selective types of agricultural irrigation equipment under a range of operating pressures and meteorological conditions, were studied. Dilute untreated sewage was sprayed through several types of systems on experimental plots. Because of the obstacle presented by evaporation to making accurate droplet size field measurements, the water-soluble fluorescent dye - uranine (sodium fluorescein) - was used as a tracer in the test aerosol. Original drop size distribution was calculated from the tracer aerosol size distribution. Deposition tests were conducted at another test site, and actual sewage spray aerosol test data were compared to tracer aerosol data. The nozzles tested lost only a small portion of their liquid output to spray droplets but all produced large quantities of small aerosols. The number of particles produced is related to wind speed and the length of time the liquid stream is exposed to wind. Although fewer aerosols are produced at low wind speeds from low spraying nozzles, concentrations may be higher due to less dilution by airflow. If fixed amounts of liquid must be emitted, fewer aerosols may be produced at greater flow rates due to shorter operating time and shorter exposure to wind. (Seip-IPA)
W78-06270

WATER QUALITY MONITORING IN DISTRIBUTION SYSTEMS,
National Sanitation Foundation, Ann Arbor, MI.
N. I. McClelland, and K. H. Mancy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 328, Price codes: A10 in paper copy, A01 in microfiche. Report No. EPA-600/2-77-074, March, 1977. 193 p, 82 fig, 27 tab, 47 ref, 3 append. 68-03-0043.

Descriptors: *Potable water, *Water quality, *Monitoring, Computers, *Pollutant identification, Hydrogen ion concentration, Temperature, Dissolved oxygen, Alkalinity, Calcium carbonate, Cadmium, Copper, Conductivity, Hardness(Water), Nitrates, Chlorides, Turbidity, Corrosion, Chlorine, Fluorides, *Free chlorine.

In order to facilitate the monitoring of public drinking water quality during transmission through distribution systems, a mobile laboratory with 18 integrated, computer-controlled parametric systems was developed and field-evaluated at ten locations in four cities: Chicago, Ann Arbor, Detroit, and Philadelphia. Commercially available and newly developed sensor systems were used to measure temperature, conductivity, pH, chloride, dissolved oxygen, free and total residual chlorine, turbidity, corrosion rate, free and total fluorides, alkalinity, hardness, nitrate, copper, cadmium, lead, and calcium carbonate deposition rate. Recommendations for operating improvements and for planning second generation equipment intended for field use include: (1) computer capabilities can and should be greatly expanded; (2) with the availability of a mini-computer, a commercial potentiostat is entirely adequate for DAVS measurements; (3) liquid junction ion-selective electrodes, i.e., hardness and nitrate should not be used when advanced technology provides more reliable electrodes; (4) use of an electrode multiplexer should be considered; (5) better provision for external grounding, replacing the plastic adapter for intake water supply, and acquiring a pump for use in low line pressure areas in the field are suggested changes in the NSF/EPA mobile laboratory. Considerable savings in time and cost can be anticipated as a result of this study. (Seip-IPA)
W78-06284

BIOLOGICAL AND ECOLOGICAL STUDIES ON THE INTERACTION OF BDELLOVIBRIO AND ENTEROBACTERIACAE,
Auburn Univ., AL.
For primary bibliographic entry see Field 5C.
W78-06289

FLUORIDE EMISSIONS FROM PHOSPHORIC ACID PLANT GYPSUM PONDS,
North Carolina State Univ. at Raleigh.
W. R. King, and J. K. Ferrell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-241 144, Price codes: A15 in paper copy, A01 in microfiche. Report No. EPA-650/2-74-095, October, 1974. 316 p, 34 fig, 19 tab, 29 ref, append. 21AFA-075, R-800950.

Descriptors: *Air pollution, *Fluorine, *Industrial wastes, *Fertilizers, *Ponds, *Phosphates, Standing waters, Gypsum, Pollutant identification, *Phosphate fertilizers, *Receiving ponds, *Fertilizer manufacture wastes, Phosphoric acid, Emissions.

An estimation and verification method was developed for predicting the fluorine emissions from ponds which receive process water from wet-process phosphoric acid plants. A pond-to-air mass transfer coefficient is developed and the vapor pressure of fluorine over pond water is estimated. These estimates were tested by measurements of ambient-air, fluorine-compound concentrations downwind from the ponds. Comparing the measured ambient air concentrations with concentrations predicted from the emission estimates and a standard atmospheric pollutant dispersion model demonstrated the validity of the emission estimates. Based on these statistical conclusions, emissions estimates for the two ponds studied were calculated. A number of pond emission estimates were made from an optimal computer simulation output. A table compares the average of these predictions for the two ponds with proposed State of Florida regulations. (Seip-IPA)
W78-06292

COAL CONVERSION PROCESS WASTEWATER CONTROL,
McKee (Arthur G) and Co., Cleveland, OH.
For primary bibliographic entry see Field 5D.
W78-06303

FATE AND BEHAVIOR OF SELECTED HEAVY METALS IN INCINERATED SEWAGE SLUDGE,
Rutgers - The State Univ., New Brunswick, NJ.
R. T. Dewling.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-24,969. PhD Thesis, 1977, 224 p.

Descriptors: *Pollutant identification, *Treatment facilities, *Path of pollutants, *Heavy metals, *Sludge disposal, *Air pollution, Incineration, Sewage sludge, Industrial wastes, Waste water treatment, Municipal wastes.

Physical properties and heavy metal concentrations were measured for sludge and ash from eight waste water treatment plants hadling up to 50% industrial waste. The median particle size of fluidized bed incinerator ash averaged 18.8 microns, and the median diameter of multiple hearth ash was 47.5 microns. Copper, chromium, cadmium, lead, nickel and zinc were preferentially concentrated with decreasing ash particle size. This relationship was attributed to the form of the metals in the sludge, non-discriminate precipitation and adsorption of the metals during drying in the incinerator, and collapse during combustion of the metal-containing sludge matrix. Over 97% of the mercury contained in raw sludge was released to the atmosphere at combustion temperatures over 1350 F. Copper, chromium, cadmium, lead, nickel, and zinc emissions were under 1% of the total weight of metal contained in the sludge. The ash metal content ranged 78-95%, depending on the metal, of the total content in raw sludge. (Snyder-FIRL)
W78-06315

MONTHLY VARIATION IN THE CHEMICAL COMPOSITION OF MANGROVE OYSTERS IN THE LAS MARITAS LAGOON (VENEZUELA), (IN SPANISH),
Universidad de Oriente, Cumana (Venezula). Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-06330

THE MARINE GEOLOGY AND SEDIMENTOLOGY OF HAWAII KAI, KUAPA POND, AND ADJACENT MAUNALUA BAY,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 2L.
W78-06345

CHARACTERIZATION OF URBAN RUNOFF - NEW YORK,
Cornell Univ., Ithaca, NY. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-06352

SOME COMMON ASPECTS OF PHYSICAL-CHEMICAL INDICES OF TOXIC SUBSTANCES AND THEIR PERMISSIBLE CONCENTRATIONS IN ATMOSPHERIC AIR, AIR OF WORKING AREAS AND WATER (IN RUSSIAN),
Nauchno-Issledovatelskii Inst. Gigieny Truda i Professionalnykh Zabolevanii, Leningrad (USSR).
For primary bibliographic entry see Field 5G.
W78-06354

CONCENTRATION AND MODES OF TRANSPORT FOR TRACE METALS IN THE HAW RIVER, NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5B.
W78-06356

THE URANIUM-SERIES RADIONUCLIDES AS TRACERS OF GEOCHEMICAL PROCESSES IN LONG ISLAND SOUND,
Yale Univ., New Haven, CT. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2L.
W78-06379

HYDROCARBONS IN CORES OF NORTHWESTERN ATLANTIC COASTAL AND CONTINENTAL MARGIN SEDIMENTS,
Woods Hole Oceanographic Institution, MA. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-06384

ENVIRONMENTAL ISOTOPIC STUDY OF THE CAMPI FLEGREI (NAPLES, ITALY) GEOTHERMAL FIELD,
Comitato Nazionale per le Ricerche Nucleari, Pisa (Italy). Lab. di Geologia Nucleare.
For primary bibliographic entry see Field 2K.
W78-06387

SURVEY OF TRACE METAL CONTENTS OF SUSPENDED MATTER IN THE ST. LAWRENCE ESTUARY AND SAGUENAY FJORD,
Quebec Univ., Rimouski. Inst. National de la Recherche Scientifique.
D. Cossa, and S. A. Poulet.
Journal of the Fisheries Research Board of Canada, Vol 35, No 3, p 338-345, March 1978. 5 fig, 2 tab, 26 ref.

Descriptors: *Trace elements, *St. Lawrence Seaway, *Estuaries, *Water analysis, *Suspended solids, Chemical properties, Water chemistry, Sediments, Oceanography, Saline water-freshwater interfaces, Manganese, Zinc, Lead, Cadmium, Pollutants, Water quality, *Saguenay Fjord.

Trace metal contents (Mn, Zn, Pb, and Cd) of suspended particulte matter were measured in the upper St. Lawrence estuary and Saguenay fjord. In the estuary, elution of the trace metal fraction adsorbed on particles seems to be responsible for the significant differences in concentrations observed at the freshwater-saltwater boundary. In the Saguenay fjord, particles from deep waters are enriched with trace metals, especially Mn, compared with those from surface waters. This enrichment probably is due to Mn oxidation and simultaneous scavenging of the other trace elements. High Pb and Cd levels in particles of surface waters of the fjord seem to depend mostly on their high affinity for the rich organic matter. (Henley-ISWS)
W78-06401

USING TOPOGRAPHIC CHARACTERISTICS TO PREDICT TOTAL SOLUTE CONCENTRATIONS IN STREAMS DRAINING SMALL FORESTED WATERSHEDS IN WESTERN MONTANA,
Montana Univ., Missoula.
For primary bibliographic entry see Field 2K.
W78-06407

THE TOXICITY TO GOLDFISH OF MIXTURES OF CHLORAMINES, LAS AND COPPER, (TOXIC CONSTITUENTS AND GROSS TOXICITY OF WASTE TREATMENT EFFLUENT TO FISHES),
Maryland Univ., College Park. Inland Environmental Lab.
For primary bibliographic entry see Field 5C.
W78-06408

DIVERSITY OF STREAM COMMUNITIES UNDER CONDITIONS OF POLLUTIONAL STRESS,
Kansas Univ., Lawrence. Dept. of Geology.
R. L. Kaesler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 500, Price codes: A03 in paper copy, A01 in microfiche. Kansas Water Resources Research Institute, Lawrence, Contribution No. 193, February 1978. 38 p, 4 fig, 7 tab, 55 ref. OWRT C-6007(No. 5200)(5).

Descriptors: *Diversity index, *Stream surveys, *Brillouin's index, *Hierarchical diversity, *Biological communities, Water pollution, *Bioindicators, Costs, Sampling, *Systematics, *Pollutant identification, Streams, Ecology, *Ecological distribution.

Indices of species diversity, which are often used to assess the state of the aquatic environment, are single values that combine the number of species in a sample with evenness of their distribution. They are convenient for expressing the state of the environment to nonecologists, but because of this simplicity they are easily misapplied, leading to erroneous interpretation. The purposes of this research were to find the index of diversity most appropriate for stream surveys; to find, if possible, ranges of diversity indicative of healthy streams, moderate pollution, and heavy pollution; and to develop and test means of reducing the cost of stream surveys by considering taxonomic categories above the species level, such as families and genera, the value of small samples, and nontaxonomic hierarchies. By using Brillouin's index, one may reduce the size of samples collected and, hence, the cost of the field survey and the time needed to collect data in the laboratory. Moreover, some purposes of applied aquatic ecolgy are served by working with families or genera rather than species, again with appreciable savings of time and money. Sufficient knowlege of functional miorphoogy and trophic structure has accumulated to allow ecologists to base environmental studies on them. One may thus gain better understanding of the structure of an aquatic community than with traditional taxonomic data.
W78-06409

THE IMPACT OF STREAM RECONSTRUCTION AND A GABION INSTALLATION ON THE BIOLOGY AND CHEMISTRY OF A TROUT STREAM,
Lehigh Univ., Bethlehem, PA. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-06410

MEASURING AND PREDICTING FLOTATION PERFORMANCE,
Toronto Univ., (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-06418

AUTOMATIC MONITORING TECHNIQUES OF EUTROPHICATION SUBSTANCES IN COASTAL SEA WATER (FY 1976-1978), (SANGYO HAISUI NO FUEIYOKASEIBUN NO SHORI NI KANSURU KENKYU-KENSHUTAUKI HAIHATSU NI KANSURU KENKYU),
Government Industrial Research Inst., Osaka (Japan).
K. Hiiro, T. Tanaka, A. Kawahara, and K. Hagiwara.

Tsusansho kogyo gijutsuin sangyo kogai kenkyu kaihatsu choseikyoku 51 nendo kogai tokubetsu kenkyu hokoku, Report of the 1976 Pollution Special Research Industrial Research Coordination Bureau of Agency of Industrial Science and Technology), No. 47, p 1-6, July, 1977. 4 fig, 3 tab, 8 ref.

Descriptors: Pollutant identification, *Eutrophication, *Phosphorus, *Nitrogen, *Red tide, *Analytical techniques, Electrodes, Nitrates, Nitrites, Phosphates, Carbon, Organic matter, Absorption, Sea water, *Monitoring, Water quality, Waste water.

A two year eutrophication study of coastal sea water vulnerable to red tide monitored nitrate ion, phosphate ion, and organic substance concentrations. Selective ion sensitive electrodes and absorbence differentials for concentration calculations were developed. Nitrate nitrogen concentrations ranging 1.4-1,400 ppm were detected by two types of electrodes developed for the study. An Urushi matrix membrane in a liquid ion exchanger produced a linear nitrate-nitrogen calibration curve similar to that produced by the polyvinyl chloride membrane in a liquid ion exchanger. Phosphate-phosphorus was monitored by a lead sulfide membrane electrode with a sensitivity range of 0.31-3,100 ppm phosphate-phosphorus at pH 7-9. Correlation coefficients for total nitrate and nitrite ions in sea and river water samples were calculated according to absorbence differences between 223 and 232 mm. The 14 sea water and 18 river water samples yielded correlation coefficients of 0.81 and 0.94, respectively. Absorbence differences between 250 and 280 nm produced a correlation factor of 0.96 to total organic carbon in the sea water samples. Fluorescence was used to measure the organic content of the sea water samples; the correlation coefficient was calculated at 0.96 for the organic and total carbon fluosescence intensities. Ion exchange and precipitation methods for enrichment of nitrate-nitrogen and phosphate-phosphorus were implemented; an automatic monitoring station is planned. (Lisk-FIRL)
W78-06469

RESEARCH ON HYGIENIC CONDITIONS OF THE OLIVERI-TINDARI LAKE COMPLEX (MESSINA),
Messina Univ. (Italy). Inst. of Hygiene.
O. C. Grillo, G. Milici, and F. Loggini.
Riv Ital Ig 36(1-3): 14-25. 1976. (In Ital. with Ital. and Engl. summ.).

Descriptors: Lakes, *Public health, *Bacteriology, *Surveys, Chemicals, Water pollution, Pollutant identification, *Bacteria, *Italy(Tyrrhenian Coast), Messina province(Italy).

A chemical and bacteriological survey is reported on the hygienic conditions of the 3 small lakes on the Tyrrhenian coast of Messina province, Italy. On the basis of the obtained results the waters of these lakes apparently are good for swimming.-Copyright 1978, Biological Abstracts, Inc.
W78-06499

FILTER MEDIA FOR SAMPLING AND MONITORING.
Water and Waste Treatment, Vol. 20, No. 10, p 54, October, 1977.

Descriptors: *Pollutant identification, *Filters, *Filtration, *Suspended solids, *Ion exchange, *Resins, Analytical techniques, Monitoring, Radioactive wastes, Magnesium, Chemical precipitation, Gravimetric analysis, Specific conductivity, Aquatic bacteria, Salmonella, Waste water treatment, Sludge treatment.

A review of filter media products, manufactured by Whatman of England for analytical and filtration processes, is presented. A glass microfiber filter that does not contain binders and can be ignited for gravimetric analysis is used in the measurement of total suspended solids in waste water. Industrial waste water in Japan is analyzed with a thick glass microfiber filter that has a high loading capacity. A paper developed by Whatman with an ion-exchange resin coating is used in the detection of metal ions in water. A glass micro-fiber filter is also used in the gravimetric analysis of rutheniun-106 in sea water. Whatman cotton cellulose thimbles are used in conjunction with a solvent to remove animal or mineral fats, greases, and oils from sludge. Specific resistance of sludge to filtration is measured with Whatman No. 1 filter papers or No. 17 chromatography paper. A glass microfiber filter with a high flow rate and 1.6 micrometer retention is used to identify Salmonella and Pseudomonas aeroginosa in water supplied. Bacteria analysis of potable water is also conducted with No. 17 filter pads. Whatman produces five glass micro-fiber filter grades and 28 cellulose filter varifies. (Lisk-FIRL)
W78-06509

TWO COMPLEMENTARY ULTRASONIC SYSTEMS.
Water and Waste Treatment, Vol 20, No 10, p 42, 44, October, 1977.

Descriptors: *Pollutant identification, *Flowmeters, *Dissolved oxygen, *Channel flow, *Ultrasonics, *Electrodes, Ions, Permselective membranes, Conductivity, Flow measurement, Analog models, Equipment.

An ultrasonic effluent sampler and monitor, produced by Endress and Hauser, provides pH, dissolved oxygen, water level, and flow data. The sampling system monitors pH and dissolved oxygen levels; the level monitor utilizes an echo gauge; and the flow metering is performed in open channels by an ultrasonic sensor. PH monitoring for short of long distances is accomplished by a constant meter reference electrode and a glass electrode that galvanically charges the effluent with a voltage dependent upon the ion concentration of the water. Dissolved oxygen levels in the waste water are measured by a gold and silver elecrtrode covered by a plastic membrane pervious only to oxygen. Flow proportional or time proportional water sampling is conducted by a glass cylinder with a air pump and a pinch valve. The level monitoring device is used for the measurement of grit, sump pump, sludge-water interfaces, and digestors. Flow measurements in open channels are accomplished by an ultrasonic gauge that monitors elapsed time of echoes between the surface of the water and the gauge. The measurement is converted into an analog signal proportional to the flow within the open channel. (Lisk-FIRL)
W78-06510

A STUDY ON THE LOADING AND PERFORMANCE OF SEWAGE TREATMENT PLANTS,
T. Stones.
Effluent and Water Treatment Journal, Vol 17, No 7, p 352-353, July, 1977. 3 tab, 11 ref.

Descriptors: *Biochemical oxygen demand, *Oxygen demand, *Nitrogen, *Carbon, *Activated sludge, Biological treatment, Biological treatment, Biological membranes, Filters, Analytical techniques, Treatment facilities, Waste water treatment.

The measurement of oxidizable load on a waste water treatment facility according to BOD and permanganate values was evaluated for the effective calculation of biological filter and activated sludge capacities. BOD and permanganate values provide only partial measurement of total carbonaceous oxygen demand and did not reflect nitrogenous oxygen demand. A comparison of BOD reduction by biological filtration and activated sludge indicated higher reduction rates by the activated sludge treatment. However, the biological filter reduced the nitrogenous oxygen demand by 73%, the dichromate value by 77.8%, and the total ozygen demand by 76.6%. The activated sludge method achieved reductions in nitrogenous oxygen demand of 23.1%, dichomate value of 69.2%, and total oxygen demand of 56.1%, reductions that were significantly lower than with biological filtration. The activated sludge method was considered better for reducing BOD than the filtration technique. For total oxygen demand, a 76% reduction was achieved by biological filtration and a 56.1% reduction by activated sludge. The analysis of total oxygen demand reduction, consisting of carbonaceous and nitrogenous oxygen demand, was considered superior to BOD and permanganate analyses for the calculation of treatment plant loading and performance. (Lisk-FIRL)
W78-06512

DETERMINATION OF COD USING A SEALED-TUBE METHOD,
Yorkshire Water Authority (England). Office of Scientific Services.
D. G. Best, and K. E. de Casseres.
Water Pollution Control, Vol 77, No 1, p 138-140, 1978. 7 tab, 3 ref.

Descriptors: *Pollutant identification, *Chemical oxygen demand, *Analytical techniques, *Oxidation, *Standards, *Volumetric analysis, Colorimetry, Chemical analysis, Instrumentation, Waste water treatment, Municipal wastes.

A sealed-tube techniques using titration or colorimetry for COD analysis of standard and oxidation-resistant compounds was compared to the conventional reflux COD method. A solution contained 10.126 g of potassium dichromate, 167 ml of sulfuric acid, and 33.3 g of mercuric sulfata was mixed in a sealed glass tube with a catalyst solution containing 22 g of silver sulfata and 2.5 liters of sulfuric acid. The mixture was rotated and heated to 150C in a block thermostat unit. The reaction mixture was then diluted and fed to a colorimeter or a titrator. This tube method was capable of recovering 100.4% of potassium hydrogen phtalate, 99.9% of glucose, and 97.4% of glutamic acid. Ethanol and sodium dodecyl benzene sulfonate, considered difficult to oxidize, were recovered more efficiently with the sealed tube method than with the standard reflux technique. The two analytical procedures were comparable in precision analyses with synthetic potassium hydrogen phthalate standard solutions and waste water samples. When compared to the reflux technique, the sealed tube process required 75% less testing space and saved an estimated 70% of the cost of chemicals for analysis. (Lisk-FIRL)
W78-06514

AIRBORNE ENTERIC BACTERIA AND VIRUSES FROM SPRAY IRRIGATION WITH WASTEWATER,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
B. Teltsch, and E. Katzenelson.
Applied and Environmental Microbiology, Vol 35, No 2, p 290-296, February 1978. 7 fig, 2 tab, 15 ref.

Descriptors: *Coliforms, *Viruses, *Sprinkler irrigation, *Return flow, *Air pollution, Air environment, Air temperature, Humidity, Solar radiation, E. coli, Waste water treatment, Waste water disposal.

Aerosolized bacteria and viruses were monitored in an agricultural area spray irrigated with sewage effluents. Marker strains of mutant E. coli, introduced into the irrigation effluent, were present in the air only when the E. coli concentration in the waste water exceeded 1,000/ml. Monitoring of temperature, solar irradiation, relative humidity, and wind velocity was conducted simultaneously with the air sampling. Peak solar irradiation coin-

cided with the minimum relative humidity level and aerosolized bacterial density. Samples obtained at night yielded bacterial concentrations 10 times higher than for corresponding daytime measurements. The correlation coefficient between bacteria and relative humidity was calculated at 0.80; the correlation coefficient with solar irridiation was -0.50. Wind velocity and temperature did not indluence bacterial density. Four out of 12 air samples collected at a distance of 40 m downwind from the irrigation site contained echovirus 7. Coliforms were detected in air samples obtained as far as 350 m downwind of the spray irrigatin lines. (Lisk-FIRL)
W78-06515

NOVEL COMBINATION METHOD ASSESSES SEWAGE ODORS,
Battelle Pacific Northwest Labs., Richland, WA.
P. M. Molton, and D. Cash.
Water and Wastes Engineering, Vol 15, No 2, p 47-48, 50, 52, February, 1978. 3 fig, 1 tab.

Descriptors: *Pollutant identification, *Odor, *Gas chromatography, *Organoleptic properties, *Sewage sludge, *Sludge digestion, Chemical degradation, Irradiation, Sludge treatment, Waste dilution, Sewage treatment, Waste water treatment, Municipal wastes.

Odor analysis of municipal sewage and sludge was accomplished by a combined method of organoleptic testing and gas chromatography. Threshold odor numbers were defined for sludge treated by digestion, irradiation, and heat, and untreated sludge in a series of tests by a six member panel. An electron capture detector was employed in the gas chromatogrophy analysis of sewage and sludge odor. Gas chromatography indicated that digestion of sludge significantly reduced the odor of the effluent. The results of the organoleptic and gas chromatography analyses indicated that odors very with time; peak odor levels were followed by odor decreases. Odor development patterns were useful in predicting maximum odor levels. Chemical treatment of minor odorous compounds was suggested as a possible means of reducing odor significantly. (Lisk-FIRL)
W78-06516

LIMITATIONS OF SINGLE WATER SAMPLES IN REPRESENTING MEAN WATER QUALITY, III. EFFECT OF VARIABILITY IN CONCENTRATION MEASUREMENTS ON ESTIMATES OF NUTRIENT LOADINGS IN THE SQUAMISH RIVER, B. C.,
Department of the Environment, Vancouver (British Columbia). Inland Waters Directorate (Pacific Region).
P. Kleiber, and W. E. Erlebach.
Technical Bulletin No 103, 1977. 9 p, 9 fig, 5 ref, 1 tab.

Descriptors: *Sampling, *Water sampling, *Water quality, *Nutrients, Variability, Measurement, Load distribution, Estimating, *Canada, *Pollutant identification, *Squamish River, British Columbia, Monte Carlo techniques.

An examination of the effect of variability in concentration measurements on estimates of nutrient loadings in the Squamish River and its tributaries has shown the limitations that result from the use of data derived from infrequent single grab samples. By the use of Monte Carlo techniques, the precision and accuracy of various measurement approaches were assessed. Correlations between discharge, measured continuously, and nutrient concentration, measured intermittently, provide a means of generating precise and accurate loading estimates. (WATDOC)
W78-06523

SHIPBOARD OIL IN WATER MONITOR.
Nucor Corp., Denville, NJ.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-027 635, Price codes: A02 in paper copy, A01 in microfiche. Report to Naval Ship Systems Command, July 1974. 24 p, 8 fig. N00024-74-C-5444.

Descriptors: *Oil pollution, *Monitoring, *Water pollution, Baseline studies, Pollution abatement, Laboratory tests, Vapor pressure, *Pollutant identification, *Outer Continental Shelf, *Flame emission techniques.

Laboratory studies were conducted to determine the feasibility of the flame emission technique for the monitoring of oil in water samples. The technique is useful for the detection of high vapor pressure oils; however, the lower vapor pressure materials were not detected reliably. The technique was investigated using steam stripping and vaporization to remove the oil from the sample. (Sinha-OEIS)
W78-06531

POLAROGRAPHIC DETECTION OF CD(II) AND CU(II) IONS IN BILGE WATER,
Naval Academy, Annapolis, MD. Dept. of Chemistry.
F. J. Gomba, M. M. Oldham, and W. D. Pennington.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-028 526, Price codes: A02 in paper copy, A01 in microfiche. Report USNA-EPRD-19, 19 February 1976, Prepared for Naval Material Command, Washington, D.C., Office of Support Technology for Period 1 July 1975 to 1 September 1975. 18 p, 3 fig, 4 ref, append.

Descriptors: *Water pollution sources, *Polarographic analysis, *Heavy metals, *Pollutant identification, Waste disposal, Toxicity, Ships, Copper, Cadmium, Nickel, *Outer Continental Shelf, Bilge water.

The detection of copper, cadmium, and nickel ions in bilge water is presented. The work extends that started in February 1974 where d.c. polarography was used to detect certain heavy metal ions in sea water. The toxicity of Cd(II) and Cr(VI) has been demonstrated in respect to mammalian cells and synergistic toxicity of Cu(II) and Zn(II) has been noted. Copper, of course, is a constituent of many alloys used in ship piping systems and corrosion in such systems would place the copper ion in bilge water discharge as a contaminant. The bilge water composition may vary greatly, but it may include oil, miscibly dispersed, which may interfere with any polarographic analysis. (Sinha-OEIS)
W78-06537

FUNDAMENTAL ANALYSIS OF THE LINEAR MULTIPLE REGRESSION TECHNIQUE FOR QUANTIFICATION OF WATER QUALITY PARAMETERS FROM REMOTE SENSING DATA,
Old Dominion Univ., Norfolk, VA. Dept. of Civil Engineering.
C. H. Whitlock, III.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-20546, Price codes: A09 in paper copy, A01 in microfiche. Ph.D. Dissertation, May 1977. 176 p, 34 fig, 23 tab, 56 ref, 3 append.

Descriptors: *Remote sensing, *Water quality, *Linear multiple regression, Data collections, Least squares, Evaluation, Analytical techniques, Equations, *Regression analysis, *Pollutant identification.

Inconsistent results have been obtained from previous experiments which have applied linear multiple regression techniques to remote sensing data for quantification of water quality parameters. The study objective is to define optical physics and/or environmental conditions under which the linear multiple regression should be applicable. An investigation of the signal response equations is conducted and the concept is tested by application to both analytical test cases and actual remote sensing data from a laboratory under controlled conditions. It is found that the exact solution for a number of optical physics conditions is of the same form as a linearized multiple regression equation, even if nonlinear contributions are made by such factors as surface reflections, atmospheric constituents, or other water pollutants. Limitations on achieving this type of solution are defined. From analytical test case results, it is concluded that constituents with linear radiance gradients with concentration may be quantified from signals which contain nonlinear atmospheric and surface reflection effects for both homogeneous and non-homogeneous water bodies, provided accurate data can be obtained and nonlinearities are constant with wavelength. The effect of error in upwelled radiance measurements is to reduce the accuracy of the least-squares fitting process and to increase the number of points required to obtain a satisfactory fit. (Bell-Cornell)
W78-06550

GROUND-WATER QUALITY NEAR THE WATER TABLE IN SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06586

THE CLINTON STREET-BALLPARK AQUIFER IN BINGHAMTON AND JOHNSON CITY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06587

WATER RESOURCES OF THE CLARK FORM BASIN UPSTREAM FROM ST. REGIS, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06588

APPRAISAL OF THE WATER RESOURCES OF DEATH VALLEY, CALIFORNIA-NEVADA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06593

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1976.
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06594

WATER RESOURCES DATA FOR MINNESOTA, WATER YEAR 1975.
Geological Survey, St. Paul, MN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06595

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1976--VOLUME 1. ARKANSAS RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06596

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1976--VOLUME 2. RED RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06597

WATER RESOURCES ALONG THE TAPS ROUTE, ALASKA, 1970-74,
Geological Survey, Anchorage, AK. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06603

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06605

APPRAISAL OF GROUND-WATER CONDITIONS IN MERCED, CALIFORNIA, AND VICINITY,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-06606

AQUATIC TOXICOLOGY AND HAZARD EVALUATION: PROCEEDINGS OF FIRST ANNUAL SYMPOSIUM ON AQUATIC TOXICOLOGY SPONSORED BY ASTM COMMITTEE E-35 ON PESTICIDES, 25-26 OCTOBER 1976, MEMPHIS, TENNESSEE.
American Society for Testing and Materials, Philadelphia, PA. Committee E-35 on Pesticides.
For primary bibliographic entry see Field 5C.
W78-06608

DETERMINATION OF TOXICITY LOADS FOR BLEACH PLANT EFFLUENTS,
B. C. Research Ltd., Vancouver.
A. Bruynesteyn.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 364-1, Final Report to February 29, 1976. 33 p, 9 fig, 8 ref, 2 tab, append.

Descriptors: *Bleaching wastes, *Toxicity, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Canada, Foreign countries, Biochemical oxygen demand, Chlorination, Water pollution, *Kraft mills, Alkaline extraction, Washing(Pulp), Wash waters.

A toxicity balance was made of the first 2 bleaching stages (chlorination and alkali extraction) of a kraft mill in the interior of British Columbia. The toxic loading of each process stream and effluent was calculated from its volume, stock flow, and number of toxic units. Excellent agreement was obtained around the pulp washers and seal boxes. The additive nature of toxic loadings of process streams entering the vat side to two washers was confirmed to within 7% and 2.5%, respectively. Of the toxic loading entering pulp washer No. 15, 96.6% was accounted for in the washer filtrate and the sheet; of that entering washer No. 25, 102.8% was accounted for in its filtrate and sheet. Of the discharged (sewered) toxic loadings, 40.2% was in the chlorination effluent and 50.8% in the alkaline extraction effluent. The bleach plant produced 20.5 kg of 5-day BOD/oven-dry ton, of which 63.9% was sewered with the chlorination effluent and 26.1% with the caustic extraction waste water. (Brown-IPC)
W78-06616

EVALUATION OF THE EFFECTS OF EFFLUENTS FROM THE PULP AND PAPER INDUSTRY ON THE PRODUCTIVITY OF MARINE ALGAE,
Nova Scotia Research Foundation, Dartmouth.
For primary bibliographic entry see Field 5C.
W78-06617

IDENTIFICATION OF TOXIC MATERIALS IN SULFITE PULP MILL EFFLUENTS,
B.C. Research Ltd., Vancouver.
R. W. Lockhart, and J. M. Leach.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 407-1, Annual Progress Report, June 1, 1975 - March 31, 1976. 65 p, 13 fig, 28 ref, 8 tab.

Descriptors: *Sulfite liquors, *Pulp wastes, *Toxicity, Wastes, Industrial wastes, Pulp and paper industry, Effluents, Fish, Water pollution sources, Foreign countries, Canada, Resin acids, *Sulfite pulp mills, *Wood extractives, Eugenols, Juvabione, Juvabiol, Spent sulfite liquor, Fatty acids.

Waste liquors from 4 low-yield Na-base sulfite mills in eastern Canada were analyzed to isolate and identify those nonvolatile constituents responsible for fish toxicity. Predominant toxic factors (accounting for 50-95% of sample toxicity) were identified as 5 resin acids (abietic, dehydroabietic, pimaric, isopimaric, and sandaracopimaric acids). Juvabione and juvabiol were minor toxicants, and three samples contained toxic levels of eugenols. Other potentially toxic constituents detected were oleic and linoleic acids and todomatuic acid. Waste liquor from a sodium-base sulfite mull on the West Coast contained low concentrations of resin acids, juvabione, and juvabiol which were responsible for only a small fraction of effluent toxicity. (Brown-IPC)
W78-06620

CONTROL OF CHEMICAL OXYGEN DEMAND IN PULP AND PAPER MILL EFFLUENTS (CONTROL DE LA DEMANDA QUIMICA DE OXIGENO EN LOS VERTIDOS DE CELULOSA Y PAPEL),
Instituto Nacional Investigaciones Agrarias, Madrid (Spain).
D. Garcia Martin, R. M. Caminos Muruzabal, and C. Garcia Vallejo.
Investigacion y Tecnica del Papel, Vol 14, No 53, p 643-666, July, 1977. 24 ref, 2 tab. English summary.

Descriptors: *Pulp wastes, *Chemical oxygen demand, Wastes, Industrial wastes, Water pollution sources, Oxygen demand, Biochemical oxygen demand, Organic compounds, Carbon, Pulp and paper industry, Effluents, Water quality.

The various parameters of waste water quality coming under the generic name of oxygen demand are reviewed, including COD (oxygen demand by autoxidation, total oxygen demand, total organic carbon) and BOD. This is followed by a discussion of the determination of the permanganate index (acid and alkaline methods), which is the oldest of the current procedures for determining COD, and of the determination of dichromate COD (Moore, AFNOR, ASTM, Leithe, and Shaw methods). Finally, a 5-day BOD, chromate COD, and acid and alkaline permanganate indices are compared as measures of the oxidizability of organic solutes of known chemical composition and of compounds in kraft mill effluents. The comparative levels of BOD and COD in pulp and paper mill effluents are also briefly considered. (Speckhard-IPC)
W78-06625

MATHEMATICAL MODELS USEFUL IN EVALUATION OF ORGANIC WASTEWATER,
Chulalongkorn Univ., Bangkok (Thailand).
For primary bibliographic entry see Field 5D.
W78-06643

ANALYSIS OF CYANIDES IN COKE PLANT WASTEWATER EFFLUENTS,
Envirodyne Engineers, Inc., St. Louis, MO.
P. J. Barton, C. A. Hammer, and D. C. Kennedy.
Journal Water Pollution Control Federation, Vol. 50, No. 2, p 234-239, February, 1978. 1 fig, 6 tab, 12 ref.

Descriptors: *Analytical techniques, *Nitrogen compounds, *Chemical wastes, *Sulfides, *Chemical precipitation, Testing procedures, Cadmium, Magnesium compounds, Copper compounds, Waste water treatment, Industrial wastes.

A sulfide interference-free method for the analysis of cyanide in coke plant waste water is described. Cyanides are present in coke plant effluent as simple cyanides, complex cyanides or ferrocyanides, and thiocyanate. Sulfide concentrations in the samples after distillation by standard methods originate from the decomposition of thiocyanate. The use of magnesium chloride during distillation is recommended to reduce complex cyanides to simple cyanides when thiocyanate is present in the sample. The American Society for Testing and Materials suggests the use of a cuprous chloride reagent during distillation. Both analytical procedures produce sulfides in the distillates, significantly interfering with the measurement of cyanides. The procedure is modified to include the precipitation of sulfide with cadmium carbonate, followed by filtration. The removal of sulfide also allows for titration and ion-selective electrode analysis. Measurements obtained with magnesium chloride distillation are reported to higher than those obtained with cuprous chloride. Results indicate that cuprous chloride reacts with oxygen, producing lower readings, and that measurement with magnesium chloride distillation is more accurate in the presence of oxygen. (Lisk-FIRL)
W78-06647

TLM TEST OF TANNERY WASTE WATERS BY USING FISH,
Showa Women's Univ., Tokyo (Japan).
H. Ikamura, and K. Shirai.
Journal of the American Leather Chemists' Association, Vol 73, No 2, p 80-85, 1978. 1 fig, 4 tab.

Descriptors: *Tannery wastes, *Killfishes, *Resistance, *Carp, *Mercury, Sodium chloride, Sulfides, Waste water disposal, Waste water treatment, Laboratory tests, Toxicity, Industrial wastes.

The median tolerance limits of cyprindonts or killfish reared in tannery effluents from the various processing stages were calculated in laboratory experiments. Fish were reared for a seven-day period in waste water samples from the tannery processes, including presoaking, soaking, liming, reliming, deliming, bating, pickling, chrome tanning, neutralization, retanning, and fatliquoring-dyeing. The liming effluent contained large quantities of sulfide; the chrome tanning wastes had high concentrations of chromium salts; and the presoaking waters contained large amounts of sodium chloride. Fish survival over periods of 24 and 48 hours was assessed for concentrations of 100, 10, 5, 2, 1, and 0.5%. Killfish survival was highest, 74% for 24 hr and 47.6% for 48 hr retention times, in the deliming-bating effluent. Soaking effluent yielded the lowest survival rate at low concentrations, followed by liming, chrome tanning, pickling, and presoaking waste waters. Similar experiments conducted with guppies, carp, goldfish, and mudfish demonstrated that presoaking, chrome tanning, and liming waste water were also toxic to these fish. (Lisk-FIRL)
W78-06653

PHYTOPLANKTONIC ASSOCIATIONS OF SWEDISH LAKES,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-06683

SOME MESOTROPHIC PHYTOPLANKTON INDICATORS,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-06684

THE FRESH AIR--CLEAN WATER EXCHANGE,
For primary bibliographic entry see Field 5G.
W78-06693

MERCURY IN THE LAKE POWELL ECOSYSTEM,
New Mexico Univ., Albuquerque. Dept. of Biology.
D. R. Sandiford, L. D. Potter, and D. E. Kidd.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 672, Price codes: A03 in paper copy, A01 in microfiche. Report NSF-RA-E-73-451, Lake Powell Research Project Bulletin, No. 1, June 1973. 7 fig, 4 tab, 34 ref. NSF GI-29422 and GI-34831.

Descriptors: *Pollutant identification, *Lake Powell(UT AZ), *Mercury, *Water pollution effects, *Path of pollutants, Pollutants, *Utah, Water pollution sources, Ecosystems, Lakes, Reservoirs, Impoundments, Fish, Algae, Aquatic plants, Crayfish, Heavy metals, Power plants, Coals, Bioaccumulation, Organic matter, *Atomic absorption.

Samples of organic and inorganic components of the Lake Powell ecosystem in Utah and northern Arizona colected during 1971-72 were analyzed for mercury content by flameless atomic absorption. Mercury levels were: fish muscle, 232 ppb; plant debris, 145 ppb; plant leaves, 34 ppb; bottom sediments, 30 ppb; algae, 29 ppb; crayfish, 10 ppb; shoreline substrates, 10 ppb; and lake water, 0.01 ppb. Bioamplification and a mercury-organic matter association were evident in this relatively-unpolluted reservoir created in 1963 by impoundment of the Colorado River. Mercury levels in the larger predatory fish approach or exceed current safe-consumption standards. An estimated mercury budget was formulated for the upper Colorado River Basin, which suggests that 1360-5440 kg mercury are released annually by natural weathering; impoundment may lead to accumulation of about 800 kg mercury in the lake system per year. Planned coal-burning power plants may produce 4600 kg mercury annually, significantly augmenting mercury levels in alek sediments, and through bioamplification increase mercury levels in large game fish by up to 150 ppb. The extent of actual mercury level increases depends on the mercury content of the coal, the degree to which the mercury enter lake drainage, and movement and bioamplification in the system. (Lynch-Wisconsin)
W78-06694

PREIMPOUNDMENT STUDY: CEDAR CREEK DRAINAGE BASIN: EVANS COUNTY WATERSHED: EVANS, TATTNALL, AND CANDLER COUNTIES, GEORGIA,
Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.
H. C. Vick, D. W. Hill, H. A. True, and R. J. Bruner, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 940, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-904/9-77-006, March 1977. 52 p, 5 fig, 13 tab, 16 ref, 6 append.

Descriptors: *Cedar Creek(GA), *Impoundments, *Multiple-purpose reservoirs, *Nutrients, *Coliforms, *Water quality control, Reservoirs, *Georgia, Baseline studies, Watersheds(Basins), Rivers, Streams, Model studies, Hydrocomp Simulation Programming model, Eutrophication, Agricultural runoff, Livestock, Coliforms, Salmonella, Fertilizers.

Twelve sampling stations on Cedar Creek near Claxton in southeastern Georgia were monitored May 1974-January 1975 to obtain baseline water quality data prior to constructing a multipurpose impoundment. The proposed impoundment will have a normal pool area of 387 acres and will drain 29,658 acres. Agricultural and livestock production and natural conditions are the only pollution sources; potential pollution problems are foreseen in the E-5 and E-6 arms. Fecal coliform densities ranged from 130-5600/100 ml in May and 100-2200/100 ml in August. Salmonella were isolated at four of five stations sampled in May. Nitrogen and phosphorus concentrations were occasionally high. Postimpoundment water quality was predicted by the Hydrocomp Simulation Programming model; no major violations of Georgia water quality standards were forecast. Major conclusion: (1) High fecal coliform densities plus Salmonella isolations represent stormwater runoff under free-flowing stream conditions; following impoundment retention, time will decrease both parameters and should produce water quality suitable for body contact recreation. (2) Eutrophication potential will depend on such nutrient source control factors as assimilation by swampy areas. (3) Attempts should be made to contain runoff from livestock feeding areas and to limit fertilizer use. (Lynch-Wisconsin)
W78-06695

GAS CHROMATOGRAPHIC DETERMINATION OF RESIDUAL AMINE LEVELS IN PLANTS (IN RUSSIAN),
All-Union Research Inst. of Agricultural Use Sewage. Staraya Kupavan (USSR).
S. I. Khramova, and K. S. Bokarev.
Fiziol Rast (MOSC) 23(3), p 625-626, 1976.

Descriptors: Pollutant identification, *Gas chromatography, *Amines, Aniline, Chlorosis, Corn(Field), Effluents, Ethylamine, Fodder, Grass, Industrial wastes, Irrigation, Methylamines, Turgor, Water pollution, Biodegradation, Plant physiology.

The use of industrial effluent water for irrigation may have a negative effect on plants, animals which are raised on fodder consisting of such plants and on the quality of the final animal products. The level of amines, which are natural protein degradation products, and of aromatic amines, used in the paint, drug and other industries, in water are of particular interest. Corn and fodder grass plants were irrigated with water containing 100-300 mg/l of dimethylamine, diethylmine or aniline. Amine levels were determined in the plants and in the rhizosphere by gas chromatography using N2 as the carrier and beta, beta'- hydrozypropionitrile as the solid phase. The water containing even low levels of amines affected the turgor of the plants initially, induced chlorosis-like symptoms and depressed growth. Trace quantities of diethylamine and aniline were found in the plants only within a few hours after irrigation. The quantities of dimethylamine were detected. Products of amine degradation, e.g., formaldehyde, are toxic to plants and animals. The analytical control of amine levels in irrigation water is recommended.--Copyright 1977, Biological Abstracts, Inc.
W78-06699

BIODEGRADATION OF ORGANIC SUBSTANCES BY BIOLOGICAL TREATMENT AND IN NATURAL WATERS (GESUIDO SHORI JO OYOBI KOKYOYO SUIIKI NI OKERU YUKIODOKU BUSSHITSU NO BUNKAI KATEI NI KANSURU KENKYU),
For primary bibliographic entry see Field 5D.
W78-06700

5B. Sources Of Pollution

CHIRONOMIDS (DIPTERA) FROM SEDIMENTS OF LAKE MARTIGNANO (LAZIO), (IN ITALIAN),
Rome Univ. (Italy). Ist. di Zoologia.
Marcello Bazzanti.
Boll Pesca Piscic Idorbiol 30(1), p 139-142, 1975.

Descriptors: *Chironomids, *Diptera, Italy, Lakes, *Martignano Lake(Italy), *Trophic level, *Lake sediments, Distribution, Path of pollutants.

The pattern of distribution and density of the Chironomidae population of Martignano lake (Latium) (Italy) is outlined in relation to the trophic condition of the lake. The biocoenosis shows a clear resemblance to those of other lakes (Bolsena, Vico, Bracciano). Its physiognomy seems typical of oligotrophic basins.--Copyright 1977, Biological Abstracts, Inc.
W78-06203

UTILIZATION OF BRACKISH WATER IN COAL GASIFICATION,
New Mexico State Univ., University Park. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 3E.
W78-06204

CONCENTRATIONS OF NUTRIENTS AND CHLOROPHYLL ON A CROSS-CHANNEL TRANSECT IN JUAN DE FUCA STRAIT, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Inst. of Oceanography.
A. G. Lewis.
Journal of the Fisheries Research Board of Canada, Vol 35, No 3, p 305-314, March 1978. 9 fig, 4 tab, 9 ref.

Descriptors: *Canada, *Nutrients, *Chlorophyll, *Nitrates, *Phosphates, *Pacific coast region, Nitrogen compounds, Phosphorus compounds, Chemical analysis, Water quality, Analytical techniques, Water analysis, Currents(Water), Oxygen, Temperature, Water circulation, *Juan de Fuca Strait(British Columbia), *Puget Sound(BC), British Columbia.

Nutrient and chlorophyll values were measured hourly at one of four stations on a cross-channel transect, over a 25-h period during each of 5 mo. Nitrate values increased with depth, chlorophyll decreased, and phosphate remained essentially unchanged during most months. Chlorophyll and phosphate values did not show consistent cross-channel trends, while nitrate levels were frequently higher on the southern side of the Strait. The cross-channel nitrate pattern can be explained, at least partially, in terms of geostrophic flow; greater amounts of nitrate-rich oceanic water enter at depth on the southern side of the Strait, while nitrate poor inshore water exists near the surface on the northern side. (Henley-ISWS)
W78-06216

THE 1976 DROUGHT IN FRANCE: CLIMATOLOGICAL ASPECTS AND CONSEQUENCES (LA SECHERESSE 1976 EN FRANCE: ASPECTS LIMATOLOGIQUES ET CONSEQUENCES),
Direction de la Meteorologie, Boulogne-Billancourt (France).
For primary bibliographic entry see Field 2B.
W78-06221

SURVIVAL AND MOVEMENT OF FECAL INDICATOR BACTERIA IN SOIL UNDER CONDITIONS OF SATURATED FLOW,
Oregon State Univ., Corvallis. Dept. of Microbiology.
C. Hagedorn, D. T. Hansen, and G. H. Simonson.
Journal of Environmental Quality, Vol. 7, No. 1, p 55-59, January-March 1978. 2 fig, 3 tab, 8 ref.

Descriptors: *Bioindicators, *Septic tanks, *Soil disposal fields, *Water pollution sources, *Sewage bacteria, Disposal, Domestic wastes, Sewage disposal, Environmental sanitation, Soil contamination, Water pollution, Bacteria, Coliforms, Soil environment, Sewage treatment, Public health, *Groundwater contamination, Tracer bacteria, Survival time.

Antibiotic-resistant fecal bacteria were used to monitor the degree of movement and subsequent groundwater contamination by septic tank effluent discharged into a drainfield under saturated conditions. Two pits of different depths were constructed to simulate drainfield beds, and groundwater samples were removed during 32-day sampling intervals from sampling wells installed at set distances from each inoculation pit. The bacteria added to the deep pit were released into a B2t horizon which contained a higher clay content than the A horizon in which the shallower pit was installed. Streptomycin-resistant strains of Escherichia coli and Streptococcus faecalis amended to each pit site moved in a directional manner, required more time to reach sampling wells when inoculated into the deeper of the two pits, and moved relatively long distances when considering that the area where the sites were located had only a 2% slope. Bacterial numbers peaked in the sampling wells in association with major rainfall patterns and the populations required longer periods to peak in the wells furthest from the inoculation pits. The results indicated that antibiotic-resistant bacteria eliminated the problem of differentiating between the amended bacteria and those nonresistant strains already in the soil, and the potential is excellent for including this type of microbiological procedure for assessing the suitability of a soil site for septic tank and waste water drainfield installations. (Henley-ISWS)
W78-06224

THE USE OF REMOTE SENSING TECHNIQUES FOR DETECTION AND IDENTIFICATION OF POLLUTANT DISCHARGES,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 5A.
W78-06230

DEVELOPMENT OF A HYDROPHOBIC SUBSTANCE TO MITIGATE PAVEMENT ICE ADHESION,
Ball Bros. Research Corp., Boulder, CO.
For primary bibliographic entry see Field 4C.
W78-06241

NEARSHORE DISPOSAL: ONSHORE SEDIMENT TRANSPORT,
Coastal Engineering Research Center, Fort Belvoir, VA.
R. K. Schwartz, and F. R. Musialowski.
Army Coastal Engineering Research Center Reprint 78-6, Reprinted from: 'Coastal Sediments '77', 5th Symposium Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 85-101, 8 fig, 7 ref.

Descriptors: *Sediment transport, *Waste disposal, *Shore protection, Beach erosion, North Carolina, Water resources, Outer Continental Shelf, *Pollutant transport, Ocean dumping, Nearshore processes, Dredge-disposal.

During the summer of 1976, relatively coarse sediment was dredged from New River Inlet, NC, moved downcoast, and placed in a 215 m coastal reach between the 2 m and 4 m depth contours. Bathymetric changes on the disposal piles and in the adjacent beach-nearshore area were studied to determine the modification of th surrounding beach-nearshore profile and the net transport direction of the disposal sediment. The sediment piles created an initial local shoal zone with minimum depths of 0.6 m. Shoaling and breaking waves caused rapid erosion of the pile tops and a gradual coalescing of the piles to form a disposal bar located seaward of a naturally occurring surf-zone bar. The disposal bar eventually migrated landward, in some cases at an average rate of 1.8 m/day, although movement appeared to be sporadic and to coincide most directly with periods of increased wave activity. Final surveys showed accretion at the base of the foreshore, complete filing of the trough, a platform or new trough at the initial surf-zone bar position, disappearance of the surf-zone bar, and generally a more seaward surf zone boundary. Profiles adjacent to the disposal area showed slight accretion seaward of the surf zone. The increased width of the platform-disposal bar complex may provide benefits by increasing the amount of wave energy dissipation in the surf zone and hence, less erosion of the beach. (Sinha-OEIS)
W78-06243

IMPLICATIONS OF SUBMERGENCE FOR COASTAL ENGINEERS,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-06244

BEACH AND NEARSHORE PROCESSES IN SOUTHEASTERN FLORIDA,
Coastal Engineering Research Center, Fort Belvoir, VA; and Florida Ocean Sciences Inst. Inc., Deerfield Beach.
For primary bibliographic entry see Field 2L.
W78-06246

SPATIAL AND TEMPORAL CHANGES IN NEW JERSEY BEACHES,
Coastal Engineering Research Center, Fort Belvoir, VA.; and Tetra Tech, Inc., Pasadena, CA.
For primary bibliographic entry see Field 2L.
W78-06247

VISUAL SURF OBSERVATIONS/MARINELAND EXPERIMENT,
Coastal Engineering Research Center, Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-06252

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX C--WATER COLUMN.
Army Engineer District, San Francisco, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-038 310, Price codes: A09 in paper copy, A01 in microfiche. April 1976. 285 p.

Descriptors: *Water quality, *Waste disposal, *Dredging, *Sediments, *Dissolved oxygen, Water pollution effects, Estuaries, California, Dredge disposal, *San Francisco Bay(CA).

Studies were conducted between 1972 and 1975 to assess the influence of local dredging and disposal operation on Bay water quality. Primary attention was given to the characterization of suspended solids loading and dissolved oxygen as modified by the operations. Emphasis was placed on these parameters because of the degree to which dredging and disposal affect concentrations and their importance in impact evaluation. Both the dredging and the disposal operation were found to influence the dissolved oxygen concentration. The effects of the dredging operation were considerably less severe than those of the disposal operation. The duration of a dissolved oxygen reduction is controlled by the contact time between sediment and water and by the intensity of its initial demand. The suspended solids concentration during the dredging operation are generally an order of magnitude lower than concentrations during the disposal operation. Another difference is that increases in solids levels during dredging are confined basically to the channel and return to background levels within several hundred meters of the dredge, whereas increases at the disposal site can influence areas outside of the site boundaries. During disposal the release of dredged sediments may result in a complete mounding of the sediments on the bottom or complete dispersion of the sediments over a large area. The evaluation of the physical conditions generated at the disposal site during a release requires information on the engineering properties of the sediment and type of dredging operation. (Sinha-OEIS)
W78-06254

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY, APPENDIX F--CRYSTALLINE MATRIX,
Battelle Pacific Northwest Labs., Richland, WA.
R. J. Serne, and B. W. Mercer.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-037 542, Price codes: A12 in paper copy, A01 in microfiche. Army Corps of Engineers, San Francisco, California, Engineer District, Bay and Estuary. Crystalline Matrix, Appendix F, May 1975. 260 p, 23 fig, 59 tab, 126 ref, append. DACW-7-73-C-0080.

Descriptors: *Heavy metals, *Waste disposal, *Sediments, *Dredging, Basline studies, Estuarine environmental water pollution sources, Water pollution effects, *California, Dredge disposal, *San Francisco Bay(CA).

A study was undertaken to determine the quantity and nature of certain heavy metals (Cd, Cu, Hg, Pb, Zn) that may be released from selected San Francisco Bay sediments as a function of various physical and chemical parameters. Ten sediment sampling stations in San Francisco Bay were selected to represent the range of sediment types and heavy metal concentrations which are involved in routine maintenance dredging and disposal. A batch sorption-desorption experiment was performed to determine the fate of sediment bound heavy metals during simulated dredging activities. It was found that under oxygen rich conditions, statistically-significant larger concentrations of Cd, Cu, Pb, and Zn were found in the water column than were found under oxygen deficient conditions. Higher salinity waters also caused larger released of cadmium and zinc than were found at low salinity. Length of agitation time in oxygen rich waters also affected the magnitude of release of copper, cadmium and zinc. Mechanisms to explain the results are discussed as are relationships of the results to the environmental effects of dredging and disposal in San Francisco Bay. Elutriate trace metal concentration predictor equations and recommendations for future work are presented. (Sinha-OEIS)
W78-06256

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX I--POLLUTANT AVAILABILITY,
California Univ., Berkeley. Lawrence Berkeley Lab.; California Univ., Berkeley. Div. of Energy and Environmental; and California Univ., Bodega Bay. Inst. of Pollution Ecology.
V. C. Anderlini, J. W. Chapman, A. S. Newton, and R. W. Risebrough.

Available from the National Technical Information Service, Springfield, VA 22161 as ADA-038 312, Price codes: A15 in paper copy, A01 in microfiche. Army Corps of Engineers, San Francisco, California, Engineer District, October 1975. 330 p, 10 fig, 61 tab, 112 ref, 2 append.

Descriptors: *Paths of pollutants, *Water pollution sources, *Water pollution effects, *Dredging, Invertebrates, *California, Baseline studies, Waste disposal, Bibliographies, Data collections, Dredge disposal, *San Francisco Bay(CA).

An integrated investigation of the effects of a dredge hopper disposal operation on pollutant availability to local invertebrate fauna and of the pathways (water, sediment, and suspended particulates) by which pollutants may be accumulated by invertebrates was undertaken in San Francisco Bay. The impact of such a spoiling operation in relation to the input of pollutants from a major point source, the East Bay Municipal Utility District's San Francisco Bay sewage outfall, was determined. Water parameters (salinity, temperature, pH, nitrate, and ammonia nitrogen and dissolved oxygen) were monitored before, during, and after the experimental spoiling to provide information on the physical-chemical conditions which may accompany or be associated with fluctuations in pollutant concentrations. The pathways by which pollutants may be accumulated by invertebrates were examined in laboratory studies and in a 'Field Laboratory' experiment in which selected invertebrate species were exposed in sity to altered concentrations of suspended particulates. The amount of trace elements redistributed annually by all dredging activities is much greater than the annual input from the EBMUD outfall, but is almost inconsequential in relation to element redistribution by settling particulated. Water quality conditions as defined by the water chemistry and suspended and settled particulate load data remained stable, without significant longer-term fluctuations, during the period of study. Fluctuations in the concentrations of the twelve elements were highly correlated with each other in sediment, invertebrates, suspended and settled particulates and suggest that only one or a few parameters may control trace element fluxes in San Francisco Bay. (Sinha-OEIS)
W78-06257

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX J--LAND DISPOSAL,
International Engineering Co., Inc., San Francisco, CA.
For primary bibliographic entry see Field 5E.
W78-06258

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX M--DREDGING TECHNOLOGY.
JBF Scientific Corp., Wilmington, MA.
For primary bibliographic entry see Field 5E.
W78-06259

GAS AND LEACHATE FROM LANDFILLS: FORMATION, COLLECTION, AND TREATMENT,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
E. J. Genetelli, and J. Cirello.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 161, Price codes: A09 in paper copy, A01 in microfiche. Report No EPA-600/9-76-004, March, 1976. 189 p, 102 fig, 51 tab, 101 ref, 2 append. 803663.

Descriptors: *Landfills, *Gases, *Leachate, *Leaching, *Waste disposal, *Waste treatment, *Soils, *Decomposing organic matter, Groundwater, Water pollution, Solid wastes, Management, Soil treatment, Ultimate disposal, Treatment, *Refuse disposal, *Sanitary landfills, Groundwater pollution.

Proceedings of a research symposium held at Rutgers University on March 25-26, 1975, which brought together researchers, administrators, and other personnel to exchange state-of-the-art ideas and findings on sanitary landfills, are reported. Topic areas discussed were gas and leachate and their formation, collection, and treatment. The compilation of papers contained in this symposium presents the Solid and Hazardous Waste Research Division, Municipal Environmental Research Laboratory research on sanitary landfills. Paper topics include: (1) current EPA research activities, (2) current Office of Solid Waste Management programs, (3) current solid waste management activities in New York State and in Puerto Rico, (4) landfill research work in progress at Harwells Hazardous Materials Service (UK), (5) a theoretical approach to gas movement through soils, (6) analytical methodologies for leachate and gas analysis, (7) leachate attenuation in undisturbed and remolded soils, (8) variations in gas and leachate production from baled and non-baled municipal refuse, (9) gas and leachate generation in various solid waste environments, (10) leachate migration through selected clays, (11) organic pollutants contributed to groundwater by a landfill, (12) attenuation mechanisms of pollutants through soils, (13) monitoring toxic chemicals in land disposal sites, (14) assessing synthetic and admixed materials for lining landfills, (15) an overview of landfill management with leachate recycle and treatment, (16) solid waste degradation due to shredding and sludge addition, and (17) case history of landfill gas movement through soils. (Seip-IPA)
W78-06263

INVERTED SIPHONS FOR OIL TRAPPING,
Calspan Corporation, Buffalo, NY.
For primary bibliographic entry see Field 5D.
W78-06268

DISPERSION OF BUOYANT WASTE WATER DISCHARGED FROM OUTFALL DIFFUSERS OF FINITE LENGTH,
California Inst. of Tech., Pasadena.
P. J. W. Roberts.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No 77-20,657. PhD Thesis, 1977. 234 p.

Descriptors: *Outfall sewers, *Dispersion, *Fluid mechanics, *Flow characteristics, *Waste dilution, Mathematical models, Froude number, Reynolds number, Mixing, Stratification, Hydraulic design, Sewerage, Waste water disposal, *Path of pollutants.

Laboratory experiments were used to examine the three-dimensional flow field produced by a line plume analogous to the dispersion of buoyant waste water released from line diffusers in ocean outfalls. Results indicated that the minimum surface dilution was independent of the diffuser length:water depth ratio (L/H) and the Reynold's number (Re) from 1,190 to 12,900. Dilutions were related to a type of Froude number (F) equal to the ratio of the cube of the current velocity (u) to the buoyancy flux per unit length (b). Dilutions were independent of current velocity and current direction for $F<0.1$ and proportional to current velocity for $F>0.1$ when the current direction was perpendicular to the diffuser. At $0.1<F<100$ the development of a vertically stable density profile resulted in dilution which was approximately 60% of that expected under conditions of uniform mixing. Horizontal spreading of the waste field was attributed to buoyancy rather than to ambient turbulence. Initial surface plume spreading was linear and was not affected by L/H and Re for 3.7 L/H 15 and 2,900 L/H 13,000. The plume spreading rate was observed to decrease beyond the initial linear zone. (Schulz-FIRL)
W78-06269

LEVEL OF CHEMICAL SUBSTANCES IN FARM CROPS GROWN ON SOIL IRRIGATED BY WASTE WATERS FROM BY-PRODUCT COKING PLANTS (ROUGH DRAFT),
Scientific Research Inst. for Foods Sanitation, Kiev (USSR). Physico-Chemical Lab.
For primary bibliographic entry see Field 3C.
W78-06272

PHENOL DEGRADATION IN ARTIFICIAL BODIES OF WATER (1970 EXPERIMENTS) (ROUGH DRAFT),
For primary bibliographic entry see Field 5C.
W78-06273

SANITARY AND ONCOLOGICAL ASSESSMENT OF AGRICULTURAL USE OF SEWAGE CONTAINING CARCINOGENIC HYDROCARBONS (ROUGH DRAFT),
Institut Eksperimentalnoi i Klinicheskoi Onkologii, Moscow (USSR).
A. P. Il'nitskii, L. G. Solenova, and V. V. Ignatova.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-tr-2959, Price codes: A02 in paper copy, A01 in microfiche. Report ORNL-tr-2959, (1974). Translation from Kazanskii Meditsinskii Zh. No 2, p 80-81, 1974. 3 p, 2 tab, 3 ref.

Descriptors: *Return flow, *Irrigation, *Aromatic compounds, *Organic compounds, *Waste water disposal, *Water reuse, Absorption, Soils, *Polycyclic aromatic hydrocarbon(PAH), *Benzapyrene(BP), *Carcinogens.

The accumulation of benzapyrene (BP) an environmentally stable, carcinogenic polycyclic aromatic hydrocarbon (PAH), which occurs in soil and crops that have been irrigated with waste water, was investigated. Three wastewater sources were studied: domestic waste water originating from a small village, textile plant waste water, and carpet plant waste water. Selected vegetable crops were subjected to year-round irrigation at a rate averaging 9000 cu m/hectare/year. The BP content was determined in soil samples, plants, and the waste waters; the quantitative determination was based on the Shpolski effect with a spectral-luminescence method. Seventy-seven soil samples and 18 samples of vegetables and fodder grass were analyzed. Domestic waste water BP content varied from 0.16.54 micrograms/l, while the textile plant waters contained 0.15.22 micrograms/l and the carpet plant waters contained 0.016.07 micrograms/l. Results indicate no BP accumulation in soil and BP content in vegetables was at the same level as in control locations. It is theorized that this absence of significant BP levels in soils and crops is due to the presence (in the turf-slight podzol, sandy loam soil) of certain species of bacteria which destroy PAH. Further research is mandated to determine the self-purification method in the soils. (Seip-IPA)
W78-06275

MICROBIAL DEGRADATION OF PHENOLS IN THE PURIFICATION OF PHENOLIC WASTE WATERS WITH ACTIVATED SLUDGE,
Nauchno-Issledovatelskii Inst. Vodosnabdyavane Kanaliz. (Bulgaria).
For primary bibliographic entry see Field 5D.
W78-06276

CARBON AND NITROGEN TRANSFORMATIONS IN SOILS AMENDED WITH SEWAGE SLUDGE,
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 5E.
W78-06282

FLUORIDE EMISSIONS FROM PHOSPHORIC ACID PLANT GYPSUM PONDS,
North Carolina State Univ. at Raleigh.
For primary bibliographic entry see Field 5A.
W78-06292

TRENCH INCORPORATION OF SEWAGE SLUDGE IN MARGINAL AGRICULTURAL LAND,
Agricultural Research Service, Beltsville, MD. Biological Waste Management Lab.
J. M. Walker, W. D. Burge, R. L. Chaney, E. Epstein, and J. D. Menzies.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 561, Price codes: A12 in paper copy, A01 in microfiche. Report No. EPA-600/2-75-034, September, 1975. 231 p, 58 fig, 69 tab, append. IBB043(ROAP21-ASE), 68-01-0162.

Descriptors: *Sludge disposal, *Trenches, Land reclamation, Salmonella, Pollutants, Indicators, Coliforms, Metals, Lime, Soil tests, Pollution indicators, Raw sludge, Digested sludge.

A method was tested for transporting and placing digested and limed raw (undigested) sewage sludges (8 to 20% solids) in trenches in study soil at loadings up to 1,150 dry tons/hectare without odor problems or hazard of surface runoff. Field scale trenching was best achieved by digging the trenches on contour not more than 75 cm deep, 60 cm wide, and from 60 to 75 cm apart. It was indicated that the ideal sludge transport method would employ concrete mixer trucks; trenches could then be filled directly from discharge chutes or indirectly with a peristaltic pump. A tracked trenching machine with a maneuverable rear-mounted digging wheel dug a new trench and simultaneously backfilled a parallel sludged trench. In two years, neither heavy metals nor pollution indicator organisms (coliform and salmonella) have moved more than about 30 cm from entrenched sludge into surrounding soil. Moderate amounts of nitrate nitrogen have moved into underdrainage water, but not into the underground aquifer. The lime in the sludge reduced metal movement into soil and availability to crops; metal uptake was modest. Tested agricultural practices included cross ripping, tilling, and cropping, with grasses recommended for the first year. Entrenchment was concluded to be feasible for sludge disposal and for improving marginal land for agricultural purposes. The appendix contains the report on cooperative research on trenching for May to November, 1974. (Wares-IPA)
W78-06297

INTERACTION OF URBAN STORMWATER RUNOFF, CONTROL MEASURES AND RECEIVING WATER RESPONSE,
Florida Univ., Gainesville.
M. A. Medina, Jr.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-17,043. PhD Thesis, 1976, 324 p.

Descriptors: *Storm water, *Urban runoff, Mathematical models, *Water pollution sources, *Hydrology, Simulation models, Stochastic processes, Synthetic hydrology, Time series analysis, Statistics, Storm runoff, Urban hydrology, Waste water treatment, Autocorrelation analysis.

Mathematical models for the movement, decay, storage, and treatment of storm water runoff pollutants and dry weather waste water flows through the urban environment and receiving waters are presented. Autocorrelation analysis is used to stochastically characterize the precipitation time and urban runoff series produced by a continuous hydrologic simulation model. Minimum dissolved oxygen concentration curves are used to illustrate the effects of waste input from wet and dry weather sources and from points upstream on receiving waters. Frequency distributions are analyzed for input and output concentrations and mass rates during single storm events and storm events recorded during a year-long period. Flow and concentration responses of storage/treatment systems are examined for completely-mixed systems with constant and variable volumes, and for one-dimensional advective systems with and without dispersion. Detention time was found to have the greatest influence on the effect of urban runoff on receiving waters. (Schulz-FIRL)
W78-06309

RUNOFF FROM A LOW-COST MANURE STORAGE FACILITY,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
F. R. Magdoff, J. F. Amadon, S. P. Goldberg, and G. D. Wells.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 4, p 658-660, July-August 1977. 4 fig, 3 tab, 6 ref.

Descriptors: *Manure storage, *Agricultural runoff, *Rainfall-runoff relationships, *Dairy industry, *Fertilizers, Runoff, Water pollution sources, Cattle, Livestock, Agriculture, Crop production, Winter, Costs, Prototype tests.

Runoff volume and quality of a low-cost manure storage facility were monitored for one year (1976) to evaluate its performance in reducing surface water pollution and conserving available nutrients. Results showed high runoff rates January through April (69% of total runoff), nutrient concentrations and amounts high enough to cause water quality deterioration in streams and ponds, and therefore significant loss of fertility value. Annual losses of nitrogen, phosphorus, potassium, and solids were 6.0, 0.4, 8.3, and 82.0 kg/cow. It is recommended that: (1) runoff from such a facility be confined to a lagoon for crop irrigation, or (2) the manure stack be covered to eliminate contaminated runoff. Although using a lagoon with a manure stack involves developing handling procedures for solid and liquid waste, this alternative may prove necessary for most dairy farms with stanchion barns in order to handle both manure and milking center wastes. The study was conducted in response to concern over winter spreading of manure on frozen or snow-covered soil when substantial nutrient losses can occur, especially during a thaw. It is noted, however, that applying manure to frozen soil which has been rough plowed may actually decrease runoff volume and soil loss. The facility, which cost $1300, was 18 x 26 m, with a 2-5% slope and a retaining plank and post wall on the low side. Successive layers of gravel, plastic cushioned with rock fines, and crushed limestone provided the bed. (Lynch-Wisconsin)
W78-06314

A KINETIC MODEL OF STEADY STATE PHOSPHORUS FIXATION IN A BATCH REACTOR I. EFFECT OF SOIL/SOLUTION RATIO,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
A. R. Overman, and R. L. Chu.
Water Research, Vol 11, No 9, p 771-775, 1977. 9 fig, 21 ref.

Descriptors: *Model studies, *Kinetics, *Phosphorus fixation, *Soil-solution ratio, *Hydrogen ion concentration, Soil mass, Phosphorus, Equations, Michaelis-Menten equations, Langmuir adsorption, Batch reactors, Phosphates.

A kinetic model for steady state phosphorus fixation in a batch reactor was developed and, in this study, tested variations in soil-solution ratio at pH 5. The model includes Langmuir type adsorption followed by a chemical reaction for a reactor with a steady phosphorus input. Measurements at pH 5 with the different soil/solution ratios all reach steady state and conform to a Michaelis-Menten type equation as predicted for the catalytic process. Maximum reaction rates show linear correlation with soil mass as expected. Involvement of an addional soil component in the adsorption process is inferred, but not confirmed. A plastic beaker 100 ml in diameter was used for the reactor vessel, and measurements were carried out at 25C. Soil was kept suspended by a stainless steel stirrer. For each run an appropriate quantity of phosphoric acid diluted to 500 ml, and adjusted to pH 5, was placed in the reactor. Phosphate solution of the desired concentration was delivered to the reactor at 3.16 ml/hr. The soil used is Lakeland fine sand collected at 30-60 cm depth in an unpolluted area; it is known to contain < 5% silt, < 5% clay, and a large amount of aluminum and iron. Experiments were conducted with 100, 150, 200, and 250 g soil in 500 ml solution. Four rates of phosphate addition were used with each quantity of soil. (See also W78-06318 and W78-06319) (Lynch-Wisconsin)
W78-06317

A KINETIC MODEL OF STEADY STATE PHOSPHORUS FIXATION IN A BATCH REACTOR II. EFFECT OF PH,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
A. R. Overman, and R. L. Chu.
Water Research, Vol 11, No 9, p 777-778, 1977. 4 fig, 12 ref. EPA S800829.

Descriptors: *Model studies, *Kinetics, *Phosphorus fixation, *Soil-solution ratio, *Hydrogen ion concentration, Phosphorus, Equations, Michaelis-Menten equations, Batch reactors, Phosphates, Soil mass, Langmuir adsorption.

A kinetic model described in another paper for steady state phsophorus fixation in a batch reactor was tested in this study for variations in pH at a constant soil/solution ratio of 250 mg/500 ml. Measurements of phosphorus fixation at pH 2, 3, 5, 7, and 8 reached a steady state and conformed to a Michaelis-Menten type equation as predicted for the catalyric process. Maximum rate of reaction decreases with increasing pH due to the competitive effecr between OH(-) and H2P04(-). The maximum value of 1/K at pH 5 showed H2P04(-) may be required in phosphorus adsorption for some specific-bonding mechanism with soil. The model assumes Langmuir type adsorption followed by a first-order chemical reaction with the solid phase of the soil. All experiments were conducted at 25C in a batch reactor consisting of plastic beaker 100 ml in diameter in which soil was dept suspended by a stainless steel stirrer. For each run a 500 ml solution of an appropriate quantity of phosphoric acid was adjusted to the various pH levels. Then 250 g of Lakeland fine sand taken from an unpolluted area at depths of 30-60 inches was put into the reactor; it contains less than 5% silt, less than 5% clay, and large amounts of aluminum and iron. A concentrated solution of phosphric acid was delivered to the soil-solution mixture at a constant rate of 3.16 ml/hr. Four rates of concentrated phosphate addition were conducted with each constant pH experiment. (See also W78-0317) (Lynch-Wisconsin)
W78-06318

A KINETIC MODEL OF STEADY STATE PHOSPHORUS FIXATION IN A BATCH REACTOR - III. EFFECT OF SOLUTION REACTION,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
A. R. Overman, and R. L. Chu.
Water Research, Vol 11, No 9, p 779-781, 1977. 3 fig, 7 ref. EPA S800829.

Descriptors: *Model studies, *Kinetics, *Phosphorus fixation, *Solution reaction, *Soil-solution ratio, Phosphorus, Equations, Batch reactors, Hydrogen ion concentration.

A kinetic model for phosphorus fixation described in two previous papers is modified to account for

phosphorus reaction in solution as well as adsorption and reaction with the solid phase of the soil. This modification is shown to change the calculated results in the expected direction. The two earlier articles dealt with effects of changing the soil/solution ratio and the pH. In all cases a steady input of phosphorus produces a steady state phosphorus concentration in solution at a particular pH and soil/solution ratio. The model treats the system as heterogeneous catalysis with Langmuir type adsorption. Due to limited number of adsorption sites in the soil, a maximum rate of reaction was calculated for each soil/solution ratio. Extrapolation of these values to zero soil mass infers that reaction occurred even the absence of soil in the reactor. It is thereby deduced that some reaction occurred in solution due to the slight solubility of aluminum and iron phosphates at pH 5. It is assumed that the solution reaction was first order, with a rate coefficient related to pH through the solubility of aluminum and iron hydroxides. An additional soil component postulated to participate in the adsorption step was still apparent. No attempt is made to identify this component. (See also W78-06317) (Lynch-Wisconsin)
W78-06319

TRANSLOCATION AND ATTENUATION OF WASTEWATER PHOSPHORUS IN STREAMS,
Rensselaer Polytechnic Inst., Troy, NY.
G. A. Carlson, Jr.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-23,782. PhD Thesis, 1977, 260 p.

Descriptors: *Pollutant identification, *Phosphorus, Natural streams, *Translocation, *Attenuation, Municipal wastes, Calcerous soils, Waste water disposal, Waste assimilative capacity, Waste water(Pollution), Waste water treatment.

Three small streams in calcareous soil zones in the western part of New York were sampled at points 5-17.5 km below waste discharge sites to assess their ability to assimilate phosphorus contained in the waste water. Stream discharge, dissolved and particulate phosphorus, chloride and calcium in the water column, and available phosphorus in the fixed bed sediments were measured bi-weekly from May to October. Equations describing the variation in these parameters along each stream under mean, high, and low flow conditions were defined using regression analysis. Chloride, used to test a conservative material's behavior, was conserved as load accumulated in a linear manner with reach. The concentration and load of dissolved phosphorus decayed exponentially with stream reach, with phosphorus load decreasing significantly downstream from each waste water outfall. Phosphorus concentration and load decayed exponentially at rates ranging 0.04-0.36/km. Concentration of available phosphorus in sediment and the phosphorus distribution along each stream indicated significant uptake as the waste discharge's impact was ameliorated. The study included that sediments in streams flowing through calcareous soil have a high, long-term assimilative capacity for phosphorus; and phosphorus in the sediments and in the water column approached equilibrium. (Snyder-FIRL)
W78-06320

EFFECTS OF UNRECORDED POLLUTION FROM URBAN STORMWATER RUNOFF ON BENTHIC MACROINVERTEBRATES OF THE GREEN RIVER, MASSACHUSETTS,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 5C.
W78-06321

ON THE CONTAMINATION OF SEA WATER WITH SALMONELLA AND FECAL INDICATOR ORGANISMS: I. OCCURRENCE AND DISTRIBUTION OF SALMONELLA AND FECAL INDICATOR ORGANISMS IN COASTAL SEA WATER OF FUKUYAMA, (IN JAPANESE),
Hiroshima Univ. (Japan). Dept. of Food Chem. Tech.
H. Hashimoto, H. Kawakami, M. Murata, H. Ushijima, and M. Nakao.
J Fac Fish Anim Husb Hiroshima Univ 15(2), p 207-218, 1976.

Descriptors: *Bioindicators, Microorganisms, *Seto Inland Sea(Japan), Sea water, Bacteria, Coastal waters, *Coliforms, *Distribution, Enterococci, *E. coli, Fukuyama, Indicators, Inland, Japan, *Salmonella.

As a part of a survey on environmental pollution of the Seto Inland Sea, Japan, a survey on the ecology of Salmonella and fecal indicator organisms in sea water samples, collected at 8 stations on the coast of Fukuyama (Japan), was conducted in June 1972-March 1974. The positive rate for occurrence of Salmonella in the samples was 12.1% (28/232). Positive Salmonella detection rates as high as 21.7-7-25% were observed at 3 stations. A higher positive rate of Salmonella occurrence was observed for samples collected during May-Oct. The incidence of Salmonella in the samples decreased as the sampling stations approached the outer part of the port and the offshore area. S. typhimurium, S. thompson, S. anatum, S. infantis, S. give, S. schleissheim, S. schwarzengrund, S. derby, S. montevideo, S. meleagridis, S. binza and S. senftenberg, and the o-groups, B, C1, D and E1 were among the 42 strains located. Most serotypes isolated in this study were similar to those previously isolated from the river waters in this district. Thus, those Salmonella serotypes contaiminating the terrestrial environment also contaminate the coastal marine environment. Higher MPN (most probably number) values and frequency of occurrence of fecal indicator organisms were observed according to the order coliforms Escherichia coli and enterococci. The coliform incidence was positive in most samples examined. A high incidence of Salmonella recovery was observed in samples having high fecal indicator MPN values and temperatures 19C.--Copyright 1977 Biological Abstracts, Inc.
W78-06331

RUNOFF FROM A PASTURED WATERSHED IN LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Agricultural Engineering.
T. S. Chisholm.
Louisiana Agricultural Experimental Station Bulletin, No. 699, p 3-14, June 1977. 5 fig, 7 ref, 3 append.

Descriptors: *Agricultural runoff, *Pastures, *Storm runoff, *Water pollution sources, *Rainfall-runoff relationships, Rainfall intensity, *Louisiana, Baton Rouge(LA), Runoff, Runoff coefficient, Rural areas, Watersheds(Basins), Model studies, Nonpoint pollution, Data collections.

Rainfall-runoff correlations for a 50-acre pastured watershed in Baton Rouge, Louisiana from 1966-69 showed that: (1) Maximum rainfall for a storm was 6.80 inches, resulting in the maximum runoff of 3.33 inches and the highest peak runoff rate of 0.592 inches/yr; this storm would have a return frequency of 3.9 years. (2) For all 43 storms total rainfall was 56.98 inches, with a total runoff of 19.72 inches (34.6% runoff). (3) October-March storms produced a runoff percent of 60.7; for April-September storms the runoff percent was 25.3. (4) Average rainfall duration for the 43 storms was 8.9 hours, and averae runoff duration was 25.1 hours. (5) Average rainfall duration for October-March storms was 18.3 hours, and for April-September storms 5.5 hours. (6) The longest runoff duration was 152 hours, resulting from rainfall of 2.85 inches and duration of 82.3 hours on very wet soil; the runoff amount was 2.77 inches (97% runoff). The study area was the Ben Hur farm, which has a .3% land slope; all runoff drained through a single outlet. Three recording rain gauges provided information on rainfall amounts and rates, and a recording H-flume gave data on runoff rates and durations. The 43 storms, although not inclusive of all storms which occurred during the study period, are representative of all seasons of the year. Rainfall amounts varied from 0.20-6.80 inches per storm. (Lynch-Wisconsin)
W78-06332

METHODS FOR AN INVESTIGATION OF UREA-N LOSS IN ARIZONA AGRICULTURAL WATERS DUE TO UREASE ACTIVITY,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
A. Fitch.
Master of Science Thesis, 1977. 65 p, 11 fig, 13 tab, 57 ref.

Descriptors: *Irrigation water, *Ureas, *Irrigation effects, Fertilizers, Agriculture, *Arizona, Irrigation, Nitrogen, *Nitrogen compounds, *Methodology, Watt method, Chisp method, Douglas method, Bremmer method, *Urease activity.

Four different methods were analyzed for the study of nitrogen loss from aqueously applied urea due to urease activity in irrigation waters. A review of the literature concerning the decomposition of urea and a review of the four methods to be used, and their results, are presented. The Watt and Chisp method was found to be less sensitive than required. The Douglas and Bremmer Test was found to be variable in the results obtained. A bubbler constructed for lab use assayed nitrogen volatilized from urease activity but is not adaptable for field studies. An acid trap test designed for field studies lacked accuracy. Further research in the field is called for. (Jamail-Arizona)
W78-06336

FACTORS CONDUCIVE TO THE CONTAMINATION OF SOIL WITH OPISTHORCHIS EGGS AND THEIR SURVIVAL IN THE ENVIRONMENT OF THE OB RIVER AREA (IN RUSSIAN),
All-Union Scientific Research Inst. of Medical Parasitology and Tropical Diseases, Moscow (USSR).
V. D. Zavoikin, O. B. Babaeva, A. M. Smirnova, N. A. Romanenko, and S. A. Beer.
Med Parazitol Parazit Bolezni 46(2), p 141-144, 1977.

Descriptors: Soil analysis, Water pollution sources, Soil contamination, *Ob River area(USSR), *Opisthorchis-felineus eggs, Russian-SFSR, Tomsk, USSR.

Examinations of 1563 soil specimens, 40 water samples and 40 bottom deposits in 14 communities of Kargasok and Upper-Keskoye districts of the Tomsk Oblast (Russian SFSR) located in the central part of the Ob-Irtysh (USSR) focus of opisthorchiasis demonstrated that the degree of soil contamination with Opisthorchis eggs reflected the prevalence rate of opisthorchiasis in the human population and regularly decreased in the upstream direction of the tributaries. O. felineus eggs in nature were unstable to the effect of the environmental factors and died in feces and the soil in summer at an average temperature of 26 degrees C within 11 days, and in winter at a temperature of -22 degrees C within 1 day. In the river water in summer, at an average temperature of 19 degrees C, Opisthorchis eggs remained viable for over 70 days. The main role in the epidemiological process is played by the eggs released into the environment in spring, particularly during the flood period.--Copyright 1978, Biological Abstracts, Inc.
W78-06346

CHARACTERIZATION OF URBAN RUNOFF - NEW YORK,
Cornell Univ., Ithaca, NY. School of Civil and Environmental Engineering.
C. D. Gates.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 250, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, May, 1976. 65 p, 22 fig, 12 tab, 23 ref. OWRT C-5341(No. 4239)(3).

Descriptors: *Urban runoff, *New York, *Biochemical oxygen demand, Biodegradation, Land use, Water pollution sources, Pollutant identification, Streamflow, *Urban land runoff, *Nonpoint source pollution, *Pollution transport, *Susquehanna River, *Chenango River, BOD mass fluxes.

The urban runoff of a 20.6 square mile area within the Binghamton, New York Standard Metropolitan Statistical Area was assessed; selection criteria demanded a mix of residential, commercial, and industrial land uses characteristic of older, smaller cities in the State. Sewer overflow discharges and point sources of wastes were located and characterized. Factors influencing the generation and transport of nonpoint source wastes by urban runoff were identified and described. Stream flow data and biological oxygen demand (BOD) concentration data for two stations above the study area (in the Chenango and Susquehanna Rivers) and at one downstream station were used to calculate BOD mass fluxes at the stations on a monthly basis during the summers of 1974 and 1975. The amounts of BOD entering the two river segments in the urban land runoff were calculated from mass balance analyses of the BOD fluxes. The differences in the upstream and downstream fluxes, corrected for point source inputs, were the basis for calculating the non-point urban land runoff loading rates. The BOD urban land runoff loading rates for 1974 and 1975 were 168 and 7,716 BOD5/sq. mi/day, respectively and are compatible with those derived from comparable study areas. Each of the BOD5 loads attributable to runoff exceeded the BOD5 input from the sewage treatment plant for the corresponding period. It is concluded that, relative to point sources, the role of urban land runoff as a non-point source of pollution is significant. (Seip-IPA)
W78-06352

CHARACTERIZATION OF THE NON-VOLATILE ORGANIC MATERIAL DURING PHYSICAL-CHEMICAL TREATMENT OF THE DISTRICT OF COLUMBIA RAW WASTE-WATER,
Washington Technical Inst., Washington, DC. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W78-06353

CONCENTRATION AND MODES OF TRANSPORT FOR TRACE METALS IN THE HAW RIVER, NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
C. L. Haynie.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 668, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, 1974. 74 p, 5 fig, 17 tab, ref. OWRT A-070-NC(1), 14-31-0001-5033.

Descriptors: Water pollution sources, Chromium, Cobalt, Iron, *Trace elements, *Heavy metals, Industrial wastes, Municipal wastes, Water sampling, Neutron Activation Analysis, *North Carolina, *Path of pollutants, *Pollutant identification, *Haw River(NC), Antimony, Transport mechanism, *Trace metals.

Concentrations of chromium (Cr), antimony (Sb), cobalt (Co) and iron (Fe) were measured in water, suspended sediments and bottom sediments of the Haw River, North Carolina using instrumental neutron activation analysis. Data indicate significant sources of antimony and chromium upstream of stations 4A and 35. Cobalt is considered to have no significant man-made source in the Haw River system. Physical and chemical separations from five stations on Troublesome and Little Troublesome Creeks were performed to delineate five modes of transport for the trace metals. Mechanisms of transport for the metals vary depending upon flow and source of the metal. Metals from geochemical weathering are transported primarily (about 60%) by the crystalline minerals. Metals from contamination are transported mainly (about 59%) by hydrous oxide coatings of iron and manganese. Adsorption, which is the major mode of transport for chromium under high flow conditions, is decreased at low flow when transport by hydrous oxides predominates. (Stewart-NC State)
W78-06356

THE IMPACT OF URBAN STORMWATER ON THE WATER QUALITY STANDARDS OF A REGULATED RESERVOIR,
Tennessee Univ., Knoxville Water Resources Research Center.
F. C. Larson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 334, Price codes: A09 in paper copy, A01 in microfiche. Research Report No. 62, March 8, 1978. 166 p, 47 fig, 32 tab, 21 ref, 4 append. OWRT A-043-TENN(4), 14-34-0001-8045.

Descriptors: *Urban runoff, *Storm water, Water quality, Flow, *Tennessee, *Water quality standards, *Reservoirs, *Storm runoff, Model studies, Sampling, Dissolved oxygen, Hydrogen ion concentration, Biochemical oxygen demand, Conductivity, *Ft. Loudoun Reservoir(Tenn), Temperature, Fecal coliforms.

Urban stormwater runoff may or may not have a significant effect on the water quality of a receiving stream. Changes in the water quality of Fort Loudoun Reservoir (near Knoxville, Tennessee) as a result of stormwater runoff were observed. A transient flow model was used to trace a slug of water for examination of water quality during runoff events. A sampling methodology was developed which, when used in conjunction with the flow model, allowed graphical predictions of water quality changes in the slug of water as it moved past the city. A grab sampling technique (used before, during and after runoff events) was also developed to increase the water quality data. Water quality parameters obtained were dissolved oxygen, pH, biochemical oxygen demand, conductivity, temperature, total solids and fecal coliforms. Over 30 test runs were included in the study. No significant water quality changes were observed between control values and those obtained after the addition of stormwater runoff in the reservoir. No general trends could be determined for any parameters which seemed to fluctuate according to conditions specific to each rainfall-runoff event. Total solids violated stream standards on two occasions, dissolved oxygen was in violation 19 times and standards for fecal coliform numbers were frequently violated.
W78-06362

THE EFFECT OF SEEPAGE ON THE DESIGN OF STORM WATER PONDS IN FLORIDA,
Florida Univ., Gainesville. Dept. of Civil Engineering.
J. P. Glass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 205, Price codes: A05 in paper copy, A01 in microfiche. Master of Engineering, Thesis, 1976. 85 p, 18 fig, 1 tab, 38 ref, 1 append. OWRT A-028-FLA(1).

Descriptors: *Storm water, *Storm runoff, *Surface runoff, *Florida, Ponds, *Design, *Seepage, Groundwater movement, Waste water disposal, Water treatment, Aquifer management, Orange County(FL), Marion County(FL), Seepage basins.

Seepage and groundwater flow factors are discussed in relation to the design of storm water seepage basins; safer and more economical ponds, resulting from a better understanding of transient flow, are emphasized. A literature review, on-site inspection of operational storm water seepage ponds, interviews with engineers and regulatory officials, and mathematical and numerical analysis of transient groundwater flow comprised the research effort. Experiments in seepage pond use for waste water disposal, water treatment, and artificial recharge aquifers are widespread, yielding pertinent information on water quality, economics, and clogging of pond bottoms applicable to Florida's conditions. Inspection of operational seepage ponds in Orange and Marion Counties indicated that successful pond design depends upon a knowledge of the sub-surface soil condition. Interviews with pond designers indicated no widely accepted design method; even though the unsteady seepage that makes these ponds work is a relatively complicated phenomenon, there is usually very little money in the design budget for analysis. Existing analytical solutions of the unsteady groundwater flow equations were reviewed. Solution of the Dupuit-Forcheimer approximation to the problem was used to prepare a dimensionless chart to aid in the design procedure. Subsequent numerical solutions of the corresponding nonlinear equations were also organized into a similar, more accurate diagram. An appendix contains a flowchart and computer program listing. (Wares-IPA)
W78-06369

BUOYANCY EFFECTS IN THERMALLY STRATIFIED OPEN-CHANNEL FLOW,
Iowa Univ., Iowa City. Dept. of Mechanics and Hydraulics.
For primary bibliographic entry see Field 8B.
W78-06371

INDUSTRIAL POINT SOURCES OF PETROLEUM: POLLUTION LOADS AND ECONOMIC PARAMETERS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
T. J. Tuffey, and P. Ginsberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 394, Price codes: A03 in paper copy, A01 in microfiche. Report NSF/RA-760381, Prepared for National Science Foundation, Washington, D.C., January 1976. 24 p, 8 tab. NSF AEN74-14810.

Descriptors: *Water pollution, *Industrial wastes, *Oil wastes, *Oil industry, Pollutants, Oil, Water pollution sources, Surveys, Industries, Effluents, Economics, Estuaries, *Delaware Estuary, Petroleum refining, Industrial effluents.

Pollution and economic parameters of refinery and non-refinery industrial effluents are discussed. The purpose was to publicize a significant data base. This resource can be of use to others as well as the project team in analyzing problem situations. Two authors from different disciplines worked independently on the informaton compiled. Different approaches caused some data overlaps that result in slightly different figures. Included were sections that provide: (1) refinery petroleum load as determined by permit search and verification; (2) other refinery parameters calculated from EPA guidelines; (3) non-refinery petroleum load as determined by permit search; and (4) an economic parameter of refinery residuals. (Sims-ISWS)
W78-06376

HYDROCARBONS IN CORES OF NORTHWESTERN ATLANTIC COASTAL AND CONTINENTAL MARGIN SEDIMENTS,
Woods Hole Oceanographic Institution, MA. Dept. of Chemistry.
J. W. Farrington, N. M. Frew, P. M. Gschwend, and B. W. Tripp.
Estuarine and Coastal Marine Science, Vol. 5, No. 6, p 793-808, November 1977. 4 fig, 3 tab, 55 ref. EPA R 802724, NSF GX352 12, ONR N00014-66-C0262; NR083-004.

Descriptors: *Organic compounds, *Cores, *Sampling, *Sediments, *Massachusetts, *Atlantic Ocean, Coasts, Continental margin, Lead radioisotopes, Depth, Gas chromatography, Urbanization, Atmospheric fallout, *Buzzards Bay(Mass), Alkanes, Cycloalkanes, Phenanthrenes.

The concentrations and composition of hydrocarbons in sections from a Pb210 dated core from Buzzards Bay, Massachusetts, were reported. Terrigenous n-alkane concentrations remain constant throughout the 62 cm and 195 years sampled. Gas chromatographic analysis on SCOT columns revealed an unresolved complex mixture of alkanes and cycloalkanes which decreases in concentration with increasing depth. Phenanthrene and C sub 1 and C sub 2 substituted phenanthrene concentrations also decreased with increasing depth, and the relative abundance of C sub 1 and C sub 2 homologs compared to phenanthrene suggest a pyrolytic origin for these aromatic hydrocarbons. The various sources of hydrocarbons in surface sediments and the processes which could govern their distribution were discussed. The most likely source of the phenanthrenes and the unresolved complex mixture of alkanes and cycloalkanes in the upper core sections circa 1900 to the present seems to be urban air fallout. A depth distribution of alkanes and cycloalkanes similar to the Buzzards Bay core was found for a second area of Buzzards Bay and for cores from sediments of the Gulf of Maine and Hudson Canyon. Two C sub 25 cycloalkenes were identified as major hydrocarbons in the sediments. Their concentratuions decrease with increasing depth in the cores. Mass spectra of these compounds and their hydrogenation products were reported. (Visocky-ISWS)
W78-06384

THE DYNAMICS OF STRATIFICATION AND OF STRATIFIED FLOW IN LARGE LAKES.
International Joint Commission-United States and Canada, Windsor (Ontario). Standing Committee on the Scientific Basis for Water Quality Criteria.
For primary bibliographic entry see Field 2H.
W78-06388

SIMULATION OF THE VERTICAL THERMAL STRUCTURES OF LAKES UNDER TRANSIENT METEOROLOGICAL CONDITIONS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 2H.
W78-06393

NEARSHORE PLUME AND CURRENT STUDIES IN EASTERN LAKE MICHIGAN,
Environmental Technical Assessments, Inc., Oak Brook, IL.
M. B. Hoglund.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 10; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 125-142, 1976. 9 fig, 2 tab.

Descriptors: *Heated water, *Lake Michigan, *On-site tests, *Water temperature, Discharge(Water), Nuclear powerplants, On-site investigations, Surveys, Measurement, Lakes, Temperature, Distribution patterns, Spatial distribution, Current(Water), *Thermal pollution, *Path of pollutants, Thermal plumes.

This study was directed toward measurement of the physical parameters associated with the thermal discharge from the Donald C. Cook Nuclear Plant, located on the southeastern shore of Lake Michigan near Bridgman, Michigan. The data, therefore, represent very localized conditions in the nearshore regions of Lake Michigan and as such, are not particularly pertinent to the large-scale dynamics of stratification and stratified flow in Lake Michigan. Furthermore, the objective of this study was to satisfy regulatory requirements of the Nuclear temperatures that exceed the ambient water temperature by 3 F or more, and to identify the areas of the lake, lake bottom and shorelines affected by the plume. It was often found that the lake water temperatures on the up-current side of the discharge are higher by approximately 1 F than the lake temperatures on the down-current side of the discharge. This pattern seems to persist at all depths. Analysis of the short-term current meter data showed that there is often little correlation in either current direction of current speed as recorded by the 4 current meters. (See also W78-06388) (Humphreys-ISWS)
W78-06396

ESTIMATES OF NONPOINT SOURCE POLLUTION BY MATHEMATICAL MODELING,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. H. McCuen, R. C. Sutherland, R. L. Powell, and G. E. Kamadulski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 553, Price codes: A02 in paper copy, A01 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No. 43, March 1978. 13 p. OWRT A-030-MD(1), 14-34-0001-7044.

Descriptors: *Water quality models, Street sweeping, *Sediment prediction, *Mathematical models, Water pollution sources, *Nonpoint pollution sources, Estimating, Environmental effects, Computer models, *Urbanization, Simulation analysis.

The environmental consequences of the rapid expansion of urban communities into areas that had previously been dominated by rural land use has been the cause of increasing concern over the past decade. Techniques for the rational analysis of the environmental quality of the affected region are needed to examine the environmental consequences of existing and future projects in the planning community. A computer simulation model was developed to estimate the accumulation of pollutants in urban subbasins. A model component is also used to estimate the removal of the pollutants for any rainfall event. The simulation model could be used by planners to estimate the pollution loading from an urban subbasin that enters streams for all or part of that region.
W78-06405

MEASUREMENT OF TRICKLING FILTER EFFECT ON POLLUTED RIVERS (MESSUNG DES BENTHALEFFEKTS IM VORFLUTER),
Technische Hochschule, Darmstadt (West Germany). Inst. fuer Wasserversorgung, Abwasserbeseitigung und Raumplanung.
W. Esser.
Wasserwirtschaft, Vol 68, No 3, p 83-85, 1978. 3 fig, 1 tab, 8 ref.

Descriptors: *Trickling filters, *Waste assimilative capacity, *Microorganisms, *Rivers, *Pollutant identification, Biological treatment, Decomposing organic matter, Slime, Bacteria, Waste water treatment, Waste water disposal.

The waste assimilative capacity of a river was found to be dependent upon both the attached organisms and suspended organisms residing in the water. On-site experiments were conducted to evaluate the contribution of attached organisms in the river self-purification process. The concept of the trickling filter was employed for the direct quantification of nutrient removal by attached organisms. The results of the study revealed that attached organism purification was responsible for 66-90% of the nutrient removal. The treatment ability of the attached organisms increased as the concentration and degradability decreased. The study verified the importance of bacterial slimes in the waste assimilative capacities of rivers. (Lisk-FIRL)
W78-06421

VIRUS ADSORPTION BY FIVE SOILS,
Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
W. D. Burge, and N. K. Enkiri.
Journal of Environmental Quality, Vol 7, No 1, p 73-76, 1978. 4 fig, 3 tab, 14 ref.

Descriptors: *Bacteriophage, *Soil types, *Clay loam, *Silts, *Adsorption, Sands, Loam, Sodium chloride, Cation exchange, Carbon, Organic compounds, Isotherms, Viruses, Kinetics, Waste water treatment, Land management.

The Freundlich isotherm was applied to the adsorption kinetics of phi X-174 bacteriophage in five soil types with varying physical and chemical properties. Adsorption rates of 6 ml of the bacteriophage were observed in 6 g samples of Aastad clay loam, Kranzburg silt loam, Palouse silt loam, Parshall silt loam, and Quincy loamy sand. The Freundlich isotherm and adsorption rate constants were calculated for adsorption of the virus by the soil were also determined. The Quincy soil with a pH of 7.2 showed no adsorption of the virus, due possibly to its high organic content. Bacteriophage adsorption was represented as a function of the square root of time. The cation exchange capacity, specific surface area, and organic carbon content of the soil correlated with the virus adsorption rates of the four remaining soils. The influence of pH was found to be significant in the adsorption of the virus by the soil. (Lisk-FIRL)
W78-06422

BIODEGRADATION OF SOME CATIONIC SURFACTANT AGENTS (BIODEGRADATION DE QUELQUES AGENTS DE SURFACE CATIONIQUES),
Monpellier-2 Univ. (France). Lab. d'Hydrobiologie.
B. Baleux, and P. Caumette.
Water Research, Vol. 11, No. 9, p 833-841, 1977. 15 fig, 1 tab, 18 ref.

Descriptors: *Biodegradation, *Alkalis(Bases), *Chlorides, *Bromides, *Surfactants, Sulfonates, Spectroscopy, Colorimetry, Bacteria, Waste water treatment, Rivers, Analytical techniques.

The biodegradation of 10 cationic surfactants in sewage wastes and river water was studied. Bacterial growth of heterotrophic populations was not inhibited or destroyed by the cationic surfactants, although pathogenic bacteria were affected. A colorimetric technique using sodium alizarine sulfonate was employed to monitor the decrease of active material during surfactant biodegradation. Measurements of biodegradation were obtained with infrared spectroscopy. The ten cationic surfactants studied were: 15 ethoxymethyl distearyl ammonium chloride, hexadecyltrimethylammonium chloride and bromide, dodecylpyridinium iodide, hexadecylpyridinium bromide, laurylpyridinium chloride, diisobutylphenoxtyethoxyethyl benzyl dimethylammonium chloride, quaternary alkylimidazolium compound, ethoxylated tertiary alkyl primary amines, and dimethyldistearylammonium chloride. Five of the alkylammonium compounds were found degradable while the other five were not. Three of the non-degradable products were cyclical alkylammonium

compounds of benzene and pyridium, while the other two were petroleum derivatives. (Lisk-FIRL)
W78-06507

ORGANOCHLORINATED RESIDUES IN WASTEWATERS BEFORE AND AFTER TREATMENT,
Laval Univ., Quebec. Dept. des Vivres.
For primary bibliographic entry see Field 5D.
W78-06518

LIMITATIONS OF SINGLE WATER SAMPLES IN REPRESENTING MEAN WATER QUALITY, III. EFFECT OF VARIABILITY IN CONCENTRATION MEASUREMENTS ON ESTIMATES OF NUTRIENT LOADINGS IN THE SQUAMISH RIVER, B. C.,
Department of the Environment, Vancouver (British Columbia). Inland Waters Directorate (Pacific Region).
For primary bibliographic entry see Field 5A.
W78-06523

QUALITY CRITERIA FOR WATER, JULY 1976.
Environmental Protection Agency, Washington, D.C. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5G.
W78-06527

OIL SPILLS, AND SPILLS OF HAZARDOUS SUBSTANCES.
Environmental Protection Agency, Washington, D.C. Div. of Oil and Hazardous Materials.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 458, Price codes: A02 in paper copy, A01 in microfiche. 1972, 22 p.

Descriptors: *Estuaries, *Oil spills, *Hazards, *Water pollution sources, *Pollution abatement, Water pollution control, *Outer Continental Shelf, Hazardous materials, Ocean dumping, Pollutant transport.

Approximately 80% of the reported spills involve oil, including crude and petroleum products ranging from grease to gasoline and waste lubricating oil. It is estimated that over 30 million gallons of oil were discharged in 1972. The remaining 20% involve hazardous polluting substances other than oils, which include poisons, corrosive materials, oxidizing agents, radioactive materials, and other compounds and mixtures where severely affect the aquatic environment. For both oil and hazardous materials the source of the discharges is linked to transport, transfer, storage, manufacturing and production operations. Oil terminals--tank storage farms and other facilities for storing oil--accidentally release oil to the environment. Spills also come from offshore platforms, tankers and other vessels, and from pipelines. The goals of EPA are to eliminate the spills, reduce discharges resulting from operational practices and minimize the impact of spills on the environment. To accomplish these goals, a three-phase program has been developed by EPA and the Department of Transportation for implementation by EPA, the U.S. Coast Guard and the Office of Pipeline Safety. The program includes response, prevention and enforcement. (Sinha-OEIS)
W78-06529

MODELING OF OIL EVAPORATION IN AN AQUEOUS ENVIRONMENT (RESEARCH ON THE EFFECTS OF CRUDE OIL TRANSFER AND UPSTREAM REFINERIES ON DELAWARE BAY),
Delaware Univ., Newark. Dept. of Civil Engineering; and Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5G.
W78-06533

BIOLOGICAL OIL SLICKS. PART I - LITERATURE EXAMINATION,
Naval Research Lab., Washington, D.C.
J. M. Leonard.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-039 553, Price codes: A03 in paper copy, A01 in microfiche. NRL Memorandum Report 955, July 1959. 30 p, 4 tab, 31 ref.

Descriptors: *Water pollution sources, *Oil pollution, *Films, *Plankton, Zooplankton, Baseline studies, Bibliographies, *Outer Continental Shelf, Biogenic oils, Literature reviews, Oil films.

It has been suggested that some of the films on the sea surface may be oils of marine biological origin. This report summarizes a survey of scientific literature relating to the distributions of oil-bearing marine plankton and the quantities of oil which may be available to form surface films. Analytical data on the composition of plankton oils indicate ample amounts of surface active substances. No definite mechanism by which the oil is liberated and comes to the surface is adduced; it is suggested that the fecal pellets of certain zooplankton provide a route by which sufficient quantities of oil could be dispersed in the sea. (Sinha-OEIS)
W78-06536

POLAROGRAPHIC DETECTION OF CD(II) AND CU(II) IONS IN BILGE WATER,
Naval Academy, Annapolis, MD. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-06537

OIL SPILL AND OIL POLLUTION REPORTS NOVEMBER 1976 - JANUARY 1977,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06539

OIL SPILL AND OIL POLLUTION REPORTS AUGUST 1976 - OCTOBER 1976,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06540

OIL SPILL AND OIL POLLUTION REPORTS MAY 1976 - JULY 1976,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06541

OIL SPILL AND OIL POLLUTION REPORTS MAY 1975 - JULY 1975,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06545

PREDICTABILITY OF LNG VAPOR DISPERSION FROM CATASTROPHIC SPILLS ONTO WATER: AN ASSESSMENT,
Arkansas Univ., Fayetteville. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5G.
W78-06546

PROCESSES, PROCEDURES AND METHODS FOR CONTROL OF POLLUTION FROM SALT WATER INTRUSION.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-06547

WAVE CLIMATE AT SELECTED LOCATIONS ALONG U.S. COASTS,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-06548

POLLUTANT TRANSFER TO THE MARINE ENVIRONMENT.
Rhode Island Univ., Kingston; and Texas Univ. at Austin. Port Aransas. Marine Science Inst.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 713, Price codes: A04 in paper copy, A01 in microfiche. Deliberations and Recommendations of the N S F, International Decade of Ocean Exploration Pollutant Transfer Workshop held in Port Aransas, Tex, Jan 11-12, 1974. 63 p, 9 fig, 9 tab, 4 app. R. A. Duce, P. L. Parker (Eds).

Descriptors: *Water pollution sources, *Heavy metals, *Oil pollution, Environmental effects, Baseline studies, *Outer Continental Shelf, *Transfer processes, *Pollutant transport, Pollutant dispersion, Ocean dumping, Petroleum hydrocarbons, Chlorinated hydrocarbons, Biological effects.

Scientists in the two-year-old Pollutant Transfer Program of the National Science Foundation, International Decade of Ocean Exploration met in a workshop at Port Aransas, Texas, on January 11-12, 1974. This report summaries their presentations as well as their discussions of and recommendations for future research. The discussion of scientific accomplishments within the Pollutant Transfer Program has been separarted into two chapters: trace metals, and chlorinated and petroleum hydrocarbons. Within these chapters are descriptions of intercalibration and standardization programs presently underway and planned. Also included are discussions of research on transfer processes to the marine environment (e.g., physical and chemical transfer in the water column and sediments, and biological transfer) of trace metals, and chlorinated and petroleum hydrocarbons. (Sinha - OEIS)
W78-06549

STEADY-STATE DISSOLVED OXYGEN MODEL FOR THE RIDEAU RIVER,
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
K. Adamowski, and A. C. Middleton.
Canadian Journal of Civil Engineering, Vol 4, No 4, p 471-481, December 1977. 5 fig, 6 tab, 14 ref.

Descriptors: *Water pollution control, *Dissolved oxygen, *Simulation analysis, *Mathematical models, *Rideau River(Canada), Parameter estimation, Data collections, Management, Water policy, Equations, Systems analysis, Effects, *Canada.

A steady-state, one dimensional dissolved oxygen (DO) model was developed for summer conditions for the Rideau River near Ottawa, Ontario. Model parameters were estimated for July 1975 conditions, and model acceptance was based on June 1975 conditions. Results of the model indicated that the tributaries in this section had only a marginal effect on DO concentrations. The major factor affecting DO concentrations was the distributed source-sink processes, which include photosynthesis, respiration, and sediment oxygen demand. River channel reaeration and aeration at dams had a minimal effect on DO. (Bell-Cornell)
W78-06574

AN EVALUATION OF THE POTENTIAL FOR USING DRAINAGE CONTROL TO REDUCE NITRATE LOSS FROM AGRICULTURAL FIELDS TO SURFACE WATERS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.

W78-06578

URBAN RUNOFF POLLUTANT ADSORPTION AND FILTERING BY SELECTED NORTHERN GUAM SOILS AND LIMESTONE,
Guam Univ., Agana. Water Resources Research Center.
W. J. Zolan, R. N. Clayshulte, and S. J. Winter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 692, Price codes: A03 in paper copy, A01 in microfiche. Publication No. 6, March 1978. 39 p, 20 fig, 7 tab, 12 ref, 2 append. OWRT A-005-GUAM(2), 14-34-0001-6054, 7023, 7024.

Descriptors: *Percolating water, *Water pollution sources, *Limestone, *Clays, Urbanization, Groundwater, *Urban runoff, Soils, *Adsorption(Soils), Percolation, *Filtration(Soils), Fecal coliforms, Bacteria, Phosphorus, Methylene Blue Active substances, Oil, Grease, Biochemical oxygen demand, *Guam.

The concentrations of most pollutants in urban runoff percolating through lysimeter columns containing Guam soil and limestone were substantially reduced. This reduction by adsorption and/or filtration occurred after percolation through 3/4 meter of substrata. Pollutants showing a 70 percent or greater reduction in concentration included total and fecal coliform bacteria, orthophosphorus, and total phosphorus. Compared to limestone, soils generally showed greater removal of MBAS and oil and grease. The mean removal rate of MBAS for soils averaged 68 percent. Mariana limestone was particularly permeable to MBAS, generally removing less than 30 percent.
W78-06581

QUALITY OF PERCOLATE BELOW THE ROOT ZONE OF SELECTED VEGETABLES GROWN IN NORTHERN GUAM,
Guam Univ., Agana. Water Resources Research Center.
J. L. Demeterio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 666, Price codes: A03 in paper copy, A01 in microfiche. Completion Report April 1978. 28 p, 14 tab, 15 ref. OWRT A-004-GUAM(1), 14-31-0001-5054.

Descriptors: *Percolating water, *Water pollution, *Clays, *Fertilizers, Pesticides, Vegetables, Root zone, Sevin, Diazinon, Malathion, Dibron, Farm wastes, Ammonium sulfate, Nitrogen, Phosphorus, Percolation, Potassium nitrate, *Guam, Tomatoes, Cabbage, Peppers, Eggplant, Water quality.

Northern Guam farms were surveyed in 1976 and 1977 for pesticid and fertilizer usage. The major pesticides used in 1976 and 1977 were sevin, diazinon, malathion, and dibron. Kethane was widely used in 1976 but not in 1977. Animal manure, 15-15-15 and 16-16-16 were the most widely used fertilizers in 1976 and 1977. A notable increase in the use of ammonium sulfate occurred in 1977. The chance of groundwater contamination from agricultural chemicals is minimal since a very small percentage of the land area is currently being utilized for full-time farming. Bench scale lysimeter studies were conducted to determine the concentrations of nitrogen and phosphorus in percolate water after passing the root zone of selected fertilized vegetables. Tomatoes, Chinese cabbage, head cabbage, eggplant, and bell pepper were grown using ammonium sulfate, chicken manure, potassium nitrate, and 15-15-15 as fertilizers. Potassium nitrate is the best nitrogen source but is cost prohibitive and 15-15-15 percolates excessive amounts of nitrate and ammonia nitrogen. Actively growing vegetables used the nitrogen in the ammonium sulfate and chicken manure at comparable rates.
W78-06582

GROUND-WATER QUALITY NEAR THE WATER TABLE IN SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, NY. Water Resources Div.
J. Soren.
Long Island Water Resources Bulletin LIWR-8, Suffolk County Dept of Environmental Control, 1977. 33 p, 3 fig, 3 maps, 5 tab, 17 ref.

Descriptors: *Water quality, *Groundwater, *Water pollution sources, *Water wells, *New York, Sampling, Shallow wells, Water analysis, Chemical analysis, Path of pollutants, Metals, Nutrients, Fertilizers, Pesticides, Sewage, Water supply, Evaluation, *Suffolk County(NY).

From 1972-75, observation wells, screened mostly from 10 to 20 feet below the water table, were installed at 171 sites throughout Suffolk County, N.Y., to (1) obtain baseline data on chemical quality of shallow ground water; (2) delineate areas currently affected by contaminants; and (3) enable future monitoring of ground-water quality. Analyses of water from the observation wells showed that in the more populated, western part of the county, significant contamination of the ground water by nitrate nitrogen had occurred mainly as a result of sewage disposal to the ground, and, in the rural eastern part, mainly from fertilizer leachates. Contamination by synthetic detergents was significant only in a small part of southwestern Suffolk County. Virtually no ground-water contamination from pesticides was found in the county. Radioactivity of the shallow ground water showed iron and manganese to occur in significant but not injurious concentrations; other metals were found to be within safety limits that have been recommended by agencies of the United States. (Woodard-USGS)
W78-06586

TIME-OF-TRAVEL AND DYE-DISPERSION STUDIES OF SELECTED STREAMS AND LAKES IN THE OSWEGO RIVER BASIN, NEW YORK, 1967-75,
Geological Survey, Albany, NY. Water Resources Div.
H. L. Shindel, L. A. Wagner, and P. H. Hamecher.
New York State Department of Environmental Conservation, Albany Report of Investigation RI-17, 1977. 153 p, 122 fig, 1 tab, 10 ref.

Descriptors: *Dye releases, *New York, *Rivers, *Lakes, *Water quality, Forecasting, Path of pollutants, Tracking techniques, Dye dispersion, Rhodamine, Streamflow, Flow rates, *Oswego River Basin(NY), *Time-of-travel studies.

In the State of New York, time of travel was determined for reaches of 21 streams in the Oswego River basin, and dispersion of dye was traced in Cross Lake and Onondaga Lake. Two dyes, rhodamine B and rhodamine WT, were used as tracers. Relations of discharge to time of travel of leading edge, peak, centroid, and trailing edge (at 10 percent of peak of dye cloud) through the subreaches are shown in graphs for streams on which more than one time-of-travel run was made. Velocities of peak dye concentration ranged from 0.05 to 2.36 feet per second. Water-surface profiles and graphs showing cumulative time of travel of peak dye concentration are presented for all reaches studied, and time-of-travel data for each subreach are given in tabular form. Curves showing the relation between time and dye concentration, derived from instantaneous dye injections, were determined for many sites within the reaches studied. (Woodard-USGS)
W78-06589

IMPACT OF POTENTIAL PHOSPHATE MINING ON THE HYDROLOGY OF OSCEOLA NATIONAL FOREST, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
J. A. Miller, G. H. Hughes, R. W. Hull, J. Vecchioli, and P. R. Seaber.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 853, Price codes: A08 in paper copy, A01 in microfiche. Water-Resources Investigations 78-6, February 1978. 159 p, 43 fig, 23 tab, 78 ref.

Descriptors: *Baseline studies, *Water quality, *Water pollution sources, *Strip mine wastes, *Phosphates, Groundwater, Aquifers, *Florida, Aquifer testing, Effluents, Streams, Evaluation, Aquifer management, Hydrologic budget, Leakage, Sinks, Water levels, *Pre-phosphate mining study, *Osceola National Forest(Fla).

Potentially exploitable phosphate deposits underlie part of Osceola National Forest, Fla. Hydrologic conditions in the forest are comparable with those in nearby Hamilton County, where phosphate mining and processing have been ongoing since 1965. Given similarity of operations, hydroloigc effects of mining in the forest are predicted. Flow of stream receiving phosphate industry effluent would increase somewhat during mining, but stream quality would not be greatly affected. Local changes in the configuration of the water table and the quality of water in the surficial aquifer will occur. Lowering of the potentiometric surface of the Floridan aquifer because of proposed pumpage would be less than five feet at nearby communities. Flordian aquifer water quality would be appreciably changed only if industrial effluent were discharged into streams which recharge the Flordian through sinkholes. The most significant hydrologic effects would occur at the time of active mining: long-term effects would be less significant. (Woodard-USGS)
W78-06590

ELUTRIATION STUDY OF WILLAMETTE RIVER BOTTOM MATERIAL AND WILLAMETTE-COLUMBIA RIVER WATER,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 5C.
W78-06592

DISTRIBUTION OF DIPHYLLOBOTHRIASIS IN THE AREA OF THE GORKI WATER RESERVOIR, (IN RUSSIAN),
Gorkovskii Meditsinskii Inst. (USSR).
T. S. Yurasova.
Med Parazitol Parazit Bolezni 46(2), p 222-223, 1977.

Descriptors: Distribution, Reservoirs, *Diphyllobothiasis, *Path of pollutants, Human diseases, Public health, Water pollution effects, Human population, *USSR(Gorky Reservoir).

The prevalence of diphyllobothriasis among the human population of the coastal areas of the Gorky water reservoir (USSR) during its development and after it was in use is reported. A number of therapeutic and prophylactic measures are suggested for reduction of the incidence of diphyllobothriasis.--Copyright 1978, Biological Abstracts, Inc.
W78-06665

TRANSFORMATION OF ORGANOTIN COMPOUNDS IN WATER, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Inst. (I) (USSR). Dept. of Public Hygiene.
For primary bibliographic entry see Field 5D.
W78-06671

TRANSLOCATION OF LABELLED FERTILIZER NITROGEN IN SOIL COLUMNS, (IN GERMAN),
Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf. Inst. fuer Landwirtschaft; and Oesterreichische Studien-

gesellschaft fuer Atomenergie G.m.b.H., Seibersdorf. Forschungzentrum.
For primary bibliographic entry see Field 2G.
W78-06674

NUTRIENT LOSS RESEARCH,
Agricultural Research Service, Columbia, MO.
For primary bibliographic entry see Field 4D.
W78-06689

SEASONAL DISTRIBUTION OF VITAMIN B12 IN LAKE KINNERET,
Kinneret Limnology Lab., Tiberias (Israel).
For primary bibliographic entry see Field 5C.
W78-06690

DISTRIBUTION OF MYXOBACTERS IN AQUATIC HABITATS OF AN ALKALINE BOG,
Central Michigan Univ., Mt. Pleasant. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-06691

5C. Effects Of Pollution

EFFECTS OF BURROWING TUBIFICID WORMS ON THE EXCHANGE OF PHOSPHORUS BETWEEN LAKE SEDIMENTS AND OVERLYING WATER,
Maine Univ. at Orono. Dept. of Botany and Quaternary Studies.
R. B. Davis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 857, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, September 1974. 31 p, 8 fig, 5 tab, 17 ref. OWRT A-022-ME(1).

Descriptors: *Lake sediments, *Phosphorus, *Tubificids, *Benthos, *Worms, *Maine, *China Lake(Me), Radioisotopes, Radioactivity, Phosphoric acid, Oxygen, Diffusion, Lakes.

Experiments were conducted with cores of undisturbed, non-calcareous sediment from China Lake, Maine. Radioactive phosphoric acid introduced into water overlying the sediment was taken up rapidly by the sediment where most of the 32P became aluminum and iron bound. Tubificids accelerated the decrease of 32P in the water and the depth of penetration of the sediment, but much of the mobility of 32P was due to diffusion. Release of 32P from the sediment to overlying water with or without oxygen occured but was impeded near the interface especially when oxygen was present. The worms did not affect the release of 32P to the water. The worms reduced the proportion of PO4-P in the interstitial water of the uppermost sediment, probably due to their effect of increasing Eh there. However, most of the mobile 32P was in some form other than PO4 which was probably redox-insensitive. The moderate effects in these experiments probably reflect the moderate populations of worms used. (See also W78-00921)
W78-06202

CHIRONOMIDS (DIPTERA) FROM SEDIMENTS OF LAKE MARTIGNANO (LAZIO), (IN ITALIAN),
Rome Univ. (Italy). Ist. di Zoologia.
For primary bibliographic entry see Field 5B.
W78-06203

CONCENTRATIONS OF NUTRIENTS AND CHLOROPHYLL ON A CROSS-CHANNEL TRANSECT IN JUAN DE FUCA STRAIT, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-06216

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX A--MAIN SHIP CHANNEL (SAN FRANCISCO BAR).
Army Engineer District, San Francisco, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-038 309, Price codes: A10 in paper copy, A01 in microfiche. June 1974. 218 p.

Descriptors: *Waste disposal, *Estuarine environment, *Dredging, *Water pollution effects, *Deposition, Baseline studies, Path of pollutants, Sediments, *California, *Dredge disposal, *San Francisco Bay(CA).

A study was conducted to determine the effects of dredge material disposal on the marine environment of San Francisco Bay and Estuary. This report on the Main Ship Channel across the San Francisco Bar presents the results of studies conducted on the San Francisco Bar during the period December 1970 through April 1972. The study program included sampling, testing and analyzing the physical, biological and chemical properties of the Main Ship Channel and disposal sites on the Bar and the determination of the material dispersion and deposition pattern during the release operations. (Sinha-OEIS)
W78-06253

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX D--BIOLOGICAL COMMUNITY,
Stanford Research Inst., Menlo Park, CA.
D. Liu, and C. Norwood.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-037 728, Price codes: A20 in paper copy, A01 in microfiche. Army Corps of Engineers, San Francisco, California, Engineer District, August 1975. 468 p, 15 fig, 64 tab, 193 ref, append. DACW-7-73-C-0059.

Descriptors: *Benthic fauna, *Sediments, *Dredging, *Environmental effects, Waste disposal, Heavy metals, Water pollution effects, *California, Estuarine environment, Dredge disposal, Environmental impact, *San Francisco Bay(CA).

The benthic community study to determine the environmental impact of dredging and disposal operations in San Francisco Bay describes the collection of 'baseline' information on sediment-swelling animals in three ship channels maintained by the Corps of Engineers, as well as in four federally authorized disposal areas for dredged material in San Francisco Bay and Estuary. This information provides a basis for evaluating future changes in the distribution and abundance of benthic animals and in certain physical and chemical properties of the water and sediment in these areas. In addition data from previous benthic-animal studies conducted in San Francisco Bay and data on the effects of heavy metals on benthic species found in the Bay were reviewed and summarized. A literature review of previous benthic community studies and of the effects of heavy metals on benthic animals reportedly found in the Bay is also incorporated in this report. (Sinha-OEIS)
W78-06255

PHENOL DEGRADATION IN ARTIFICIAL BODIES OF WATER (1970 EXPERIMENTS) (ROUGH DRAFT),
N. A. Lapteva, T. F. Mikryakova, L. A. Baronkina, B. F. Zhukov, and N. V. Goryacheva.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-tr-2930, Price codes: A02 in paper copy, A01 in microfiche. Report ORNL-tr-2930, (1975). Translation from Institut Biologii Vnutrennikh Vod. Trudy, Vol 24, p 159-166, 1973. 10 p, 5 fig, 5 tab, 7 ref.

Descriptors: *Phenols, *Aquatic bacteria, *Water pollution effects, Nitrates, *Phosphates, *Absorption, *Oxidation, Toxicity, Toxins, Oxygen, Temperature, Ammonia, Water pollution, *Phenol accumulation, *Saprophytic anaerobes, *Saprophytes, Flagellates insuforia, Phenol bacteria.

Phenol concentration was varied in 7 plantings of Elodea, Lemna, and Spirogyra to determine the effect on biotic populations. Nitrogen and phosphorus salts were added to one planting and their effects were monitored. Microbe populations were surveyed for number of saprophytic anaerobes, total bacterial content, and number of phenol bacteria (saprophytes that destroy phenol). Weekly measurements of nitrate nitrogen, phosphate phosphorus, ammonia, and phenol concentrations were taken; daily measurement of the number of colorless flagellates and infusoria, oxygen content, and water temperatures were made. Results indicate that the presence of biogenic elements (nitrates and phosphates) prevents phenol accumulation by accelerating its destruction. After addition of large doses of phenol, the number of phenol bacteria increased. Colorless flagellates appeared earlier in plantings containing biogens and was higher in plantings to which large doses of phenol were added. In high phenol-content plantings, fungus content was higher than in those with no or little phenol. The role of temperature, oxygen, and nitrogen and phosphorus salts in the destruction of phenol was demonstrated. The most reliable index of the degree of phenol contamination of water is the number of phenol-destroying bacteria and not the total amount and content of this group of saprophytic bacteria which is found. The number of phenol-oxidizing bacteria does not indicate the rate of phenol destruction. Saprophytic anaerobes are present when there is a rapid destruction of phenol. The amount of phenol and saprophytic bacteria in the bottom silt and bottom water layer is greater than in the water mass. (Seip-IPA)
W78-06273

AN ENVIRONMENTAL SURVEY OF EFFECTS OF DREDGING AND SPOIL DISPOSAL, NEW LONDON, CONNECTICUT: 4TH QUARTERLY REPORT.
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A015 647, Price codes: A06 in paper copy, A01 in microfiche. Prepared for Naval Facilities Engineering Command, Philadelphia, Penn., Informal Report No 75, August, 1975. 118 p, 33 fig, 32 tab, 8 ref, 4 append.

Descriptors: *Dredging, *Spoil banks, Ecology, *Environmental effects, *Fish populations, *Water pollution effects, Mercury, Connecticut, Flow characteristics, Flow system, Flow measurement, *Thames River(CT), New London Dumping Ground, *Dredging material disposal, *Spoil disposal.

Results of the fourth 3-month period (March-May 1975) of studies monitoring the effects of dredging in the Thames River and spoil disposal at the New London Dumping Ground are reported. Completed surveys of dredging impact on suspended materials in the river confirm that effects are limited to within 150 m of the dredge. Predredging circulation in the lower river is estimated: a model of the river's flow characteristics has been selected and is being tested. Hg was lower in Feb. and Apr. 1975 than during earlier periods, perhaps due to removal by dredging of contaminated sediments. Spoil pile observations found materials cohesive and spoil related turbidity low. Overall finfish abundance was much lower in Feb. 1975 than in earlier surveys, though populations in and near the spoiling area were within the same range as those collected at 'control' stations located some distance from the designated

spoiling area. Large decreases in benthic macrofaunal densities attributable to natural seasonability were observed throughout the study area between predisposal and April 1975 collections. Declines in numbers of species and species diversities were smaller except in the immediate spoiling area. The major detrimental effect of spoiling to date has been through actual burial of existing communities over a relatively small area (within 0.5 mile of the disposal buoy). Predisposal water and sediment samples from 44 stations were analyzed for fecal coliform and other bacteria; highest counts were found in the river and were higher at disposal area stations on an ebb tide than on a flood tide. River outflow may have an effect on water quality within the designated disposal area. (Seip-IPA)
W78-06274

BIOLOGICAL AND ECOLOGICAL STUDIES ON THE INTERACTION OF BDELLOVIBRIO AND ENTEROBACTERIACAE,
Auburn Univ., AL.
J. M. Westergaard.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-16,790. PhD Thesis, 1977, 284 p.

Descriptors: *E. coli, *Sewage bacteria, *Viruses, *Parasitism, *Enteric bacteria, Analytical techniques, Microorganisms, Path of pollutants, Coliforms, Water analysis, Waste water treatment, Municipal wastes, Bdellovibrio.

The occurrence of Bdellovibrio and its possible hosts (Enterobacteriaceae, Pseudomonadaceae, Vibrionaceae, Neisseriaceae, Chromobacterium, Streptococcus, Rhodotorula, Escherichia coli, Klebsiella pneumoniae, and Salmonella pullorum) was investigated with water samples collected from wells, ponds, streams, waste water oxidation lagoon systems, and municipal waste water treatment plants. Although Bdellovibrio was most easily isolated from municipal waste water, studies indicated that Bdellovibrio was not incorporated into the intestinal microflora population of animals. The simulataneous 3-log reduction in Bdellovibrio and the host E. coli when a waste water innoculated mixture was incubated for 72 hr suggested that biologica purification of waste water by Bdellobivrio was minor. (Schulz-FIRL)
W78-06289

SYMPOSIUM PROCEEDINGS: ENVIRONMENTAL ASPECTS OF FUEL CONVERSION TECHNOLOGY, II (DECEMBER 1975, HOLLYWOOD, FLORIDA).
Research Triangle Inst., Research Triangle Park, NC.
For primary bibliographic entry see Field 5D.
W78-06302

CLIMATIC EFFECTS ON WASTEWATER TREATMENT,
North Dakota State Univ., Fargo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-06305

A KINETIC MODEL OF STEADY STATE PHOSPHORUS FIXATION IN A BATCH REACTOR I. EFFECT OF SOIL/SOLUTION RATIO,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-06317

A KINETIC MODEL OF STEADY STATE PHOSPHORUS FIXATION IN A BATCH REACTOR II. EFFECT OF PH,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-06318

A KINETIC MODEL OF STEADY STATE PHOSPHORUS FIXATION IN A BATCH REACTOR - III. EFFECT OF SOLUTION REACTION,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-06319

EFFECTS OF UNRECORDED POLLUTION FROM URBAN STORMWATER RUNOFF ON BENTHIC MACROINVERTEBRATES OF THE GREEN RIVER, MASSACHUSETTS,
Massachusetts Univ., Amherst.
J. M. Pratt.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-30582. PhD Thesis, 1977, 202 p.

Descriptors: *Urban runoff, *Bioindicators, Diversification, *Diptera, *Benthic fauna, Mayflies, Oligochaetes, Gastropods, Microorganisms, Urban drainage, Waste water disposal, On-site investigations, Municipal wastes, *Massachusetts, *Green River(Mass).

The impact of pollutant-bearing runoff on benthic microinvertebrates was evaluated in a year-long investigation of the urban and non-urban areas of the Green River in Massachusetts. General water sample analyses showed that wet weather runoff levels were not usually biologically limiting. One sampling station was located above the primary urban area and five stations were established downstream from it. Using the Brillouin species diversity index, the urban mean diversity of collections declined from 4.4 to 3.0 in a downstream direction, while the upstream collection averaged 4.7. Collections in the spring were the most diverse. Diptera, Ephemeroptera, and Trichoptera were the dominant species in the upstream samples. The downstream urban samples showed high diversities of Diptera, Oligochaeta, and Gastropoda, with lower densities of Ephemeroptera and Trichoptera. Pollution-sensitive taxa were replaced by forms more tolerant of urban runoff; species dissimilarity was observed in samples obtained farther downstream. Pollution-sensitive species indicated that urban runoff disrupted the biota, particularly during summer periods of low flow. Urban runoff disruption appeared to be localized in the riverbed. (Lisk-FIRL)
W78-06321

BODY COMPOSITION, GROWTH RATE AND GROSS GROWTH EFFICIENCY OF YOUNG CARPS (CYPRINUS CARPIO L.) KEPT UNDER INTENSIVE CULTURE CONDITIONS. (IN GERMAN),
Freiburg Univ. (West Germany). Limnologisches Inst.
H. Kausch, and F. Ballioncusmano.
Arch Hydrobiol Supplement B 48(2), p 141-180, 1976.

Descriptors: *Juvenile growth stage, Thermal pollution, Heated water, Waste water treatment, Activated sludge, *Carp, Denitrification, *Growth rates, Model studies.

A description of a warm water recirculating system for carp culture is given. Waste water is treated with activated sludge under oxidative and anoxidative conditions. Due to denitrification no accumulation of NO3 takes place. Body composition, caloric content, growth rate and gross growth efficiency of 16-100 g wet wt carp (C. carpio L.) fed on trout pellets (42% protein) at different feeding levels are shown. An empirical model of the relation between ration and growth (both in grams of dry weight) indicates that the level of growth is determined by body size and ration size.--Copyright 1977, Biological Abstracts, Inc.
W78-06323

NITROGEN FIXATION IN LAKES OF THE LAKE WASHINGTON DRAINAGE BASIN,
Washington Univ., Seattle. Dept. of Microbiology.
D. L. Tison, F. E. Palmer, and J. T. Staley.
Water Research, Vol. 11, No. 9, p 843-847, 1977. 2 fig, 2 tab, 18 ref.

Descriptors: *Lakes, *Trophic level, *Nitrogen fixation, *Lake Washington Basin(WA), *Acetylene reduction, Lake Washington(WA), Lake Sammamish(WA), Lake Findley(WA), Lake Chester Morse(WA), Washington, Oligotrophy, Mesotrophy, Algae, Epilimnion, Eutrophication.

Measurements of biological nitrogen fixation rates using the acetylene reduction technique in epilimnetic waters of four lakes near Seattle, Washington support the hypothesis that rates are directly related to a lake's trophic status. Lower rates were measured in Lakes Findley and Chester Morse, considered oligotrophic, than in Lakes Washington and Sammamish, which are mesotrophic. It should be noted that algal blooms in eutrophic lakes may be dominated by species which do not fix nitrogen, and in nutrient-poor lakes cyanophytes may fix nitrogen at rates which are low but significant in proportion to the nitrogen cycling of the community. On an annual basis, epilemnetic biological nitrogen fixation is not a major source of fixed nitrogen for any of the four lakes investigated, though it may be important in summer when inorganic forms of nitrogen have been depleted from the epilimnion. The contribution of fixed nitrogen in these lakes, all of which are in the Lake Washington basin, is estimated at less than 1% of the total annual nitrogen input from other sources. Nitrogen fixation was detected regularly during the summer in the two mesotrophic lakes, but only occasionally in the oligotrophic lakes. Comparisons are made with the Great Lakes, and with lakes in California, Alaska, and Wisconsin. Measurements used in this study were made between June 1973 and October 1974. (Lynch-Wisconsin)
W78-06326

PRODUCTION OF PIKE, ROACH AND CHUB IN A SELECTED FRAGMENT OF PILICA RIVER (BARBEL REGION),
Lodz Univ. (Poland). Dept. of Comparative Anatomy and Animal Ecology.
T. Penczak, Z. Maciej, and M. Marek.
Pol Arch Hydrobiol 23(1), p 139-153, 1976.

Descriptors: *Biomass, *Chub, Esox-lucius, Leuciscus-cephalus, *Pike, *Pilica River(Poland), Rivers, *Roach, Rutilus-rutilus, Water pollution effects, *Fish reproduction.

In a morphologically uniform fragment of the Pilica River (barbel region) (Poland), characterized by a high and closely determined degree of water pollution, the production and biomass of 3 predominant ichthyofauna species were investigated. Presumably, water pollution is the main factor limiting the chub (leuciscus cephalus) population. The pike (Esox lucius) population is greatly reduced by catches discordant with the protective size (catching of yound, < 40 cm long individuals). The young year classes of the roach (Rutilus rutilus) population remain under a strong pressure of the pike.--Copyright 1977, Biological Abstracts, Inc.
W78-06329

MONTHLY VARIATION IN THE CHEMICAL COMPOSITION OF MANGROVE OYSTERS IN THE LAS MARITAS LAGOON (VENEZUELA), (IN SPANISH),
Universidad de Oriente, Cumana (Venezula). Inst. of Oceanography.
J. Bonilla Ruiz.
Bol Inst Oceanogr Univ Oriente Cumana 14(1), p 117-128, 1975.

Descriptors: *Phosphates, *Nitrogen, *Carbohydrates, Chemicals, Crassostrea-Rhizophorae, *Lagoons, Las-Maritas Island, Mangroves, Monthly, *Oysters, *Venezuela, Seasonal.

Montly variation in the chemical compositon of 2 sizes, 4-6 and 6-8 cm, of mangrove oysters (Crassostrea rhizophorae) from the Maritas Lagoon Island, Venezuela, was studied from July 1967-Dec. 1969. The seasonal fluctuation in height, moisture and chemical compounds of the fresh and dried meat of the oyster seemed to be similar in both size groups studied and no cyclic sequences in the variation were observed. The carbohydrate concentration showed a maximum in Aug. 1967, and Jan., Nov. and Dec. 1969. By comparison of the carbohydrate content of the oysters and the phosphate and organic and inorgganic-N content of the water from the eastern and western zones of the laguna Las Maritas a possible correlation was studied among these parameters; an inverse tendency was observed in the relationships among phosphate, inorganic-N and carbohydrate content. To know the yield of oysters C. rhizophorae from the laguna Las Maritas, a comparison of the fattening of this oyster with the fattening of the oyster C. rhizophorae from Bahia de Mochima and Laguna Grande (Venezuela) and the oyster C. virginica from the Guariquen zone (Venezuela) was made. They showed a great difference in fattening.--Copyright 1977 Biological Abstracts, Inc.
W78-06330

ON THE CONTAMINATION OF SEA WATER WITH SALMONELLA AND FECAL INDICATOR ORGANISMS: I. OCCURRENCE AND DISTRIBUTION OF SALMONELLA AND FECAL INDICATOR ORGANISMS IN COASTAL SEA WATER OF FUKUYAMA, (IN JAPANESE),
Hiroshima Univ. (Japan). Dept. of Food Chem. Tech.
For primary bibliographic entry see Field 5B.
W78-06331

THE IMPACT OF URBAN STORMWATER ON THE WATER QUALITY STANDARDS OF A REGULATED RESERVOIR,
Tennessee Univ., Knoxville Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-06362

IMPACT OF FEDERAL AND STATE WATER QUALITY LAWS ON ALASKA NATIVE REGIONAL CORPORATIONS.
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5G.
W78-06366

ESTIMATES OF NONPOINT SOURCE POLLUTION BY MATHEMATICAL MODELING,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-06405

FERTILIZING POND WATER: CRITICAL REVIEW (IN SERBO-CROATIAN),
Poliopr. Fak., Zavod Poliopr. Zool., Zagreb, Yugosl.
B. Rzanicanin, and I. Balzer.
Poljopr Znan Smotra 37(47), p 11-18, 1976.

Descriptors: *Fertilizing pond water, Fish, Minerals, *Nitrogen, Phosphates, Ponds, Reviews, Water pollution, Organic fertilizers, *Fertilizers, Cultures, Mineral fertilizers.

The use of mineral and organic fertilizers in pond water in relation to fish culture is discussed. The use of N fertilizers and phosphates is necessary. Organic fertilizers, added to mineral fertilizers, cover more requirements, and are therefore superior.--Copyright Biological Abstracts, Inc.
W78-06406

THE TOXICITY TO GOLDFISH OF MIXTURES OF CHLORAMINES, LAS AND COPPER, (TOXIC CONSTITUENTS AND GROSS TOXICITY OF WASTE TREATMENT EFFLUENT TO FISHES),
Maryland Univ., College Park. Inland Environmental Lab.
C. Tsai, and J. A. McKee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 554, Price codes: A03 in paper copy, A01 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No. 44, April 1978. 31 p, 7 fig, 4 tab, 47 ref. OWRT A-029-MD(1), 14-34-0001-7044.

Descriptors: *Toxicity, *Goldfish, *Chloramines, *Copper, *Bioassay, *Sewage effluents, Water pollution effects, Chemical wastes, Chlorination, *Linear alkylate sulfonates, Detergents.

The toxicity to goldfish to mixtures of chloramines linear alkylate sulfonate (LAS) and copper was studied by a continuously flowing bioassay during an exposure period of 96 hours. The results indicate that interactions of individual toxicities of these three chemicals were either additive of synergestic, depending on the rates of toxic action of the individual chemicals, toxicity ratios of the chemicals in the mixtures, and the concentrations of the mixtures.
W78-06408

THE IMPACT OF STREAM RECONSTRUCTION AND A GABION INSTALLATION ON THE BIOLOGY AND CHEMISTRY OF A TROUT STREAM,
Lehigh Univ., Bethlehem, PA. Dept. of Biology.
P. T. Bradt, and G. E. Wieland, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 543, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, January 1978. 61 p, 9 fig, 19 tab, 46 ref, append. OWRT C-7145(6225)(1).

Descriptors: *Gabions, *Rechanneling, *Benthic macroinvertebrates, Biomass, *Diversity index, Water chemistry, Flow velocity, Brown trout, *Stream reconstruction, Limestone springs, *Stream improvement, *Channel improvement, Water pollution effects, Dissolved oxygen, Oxygen saturation, Alkalinity, *Bushkill Creek(Penn), *Pennsylvania.

The purpose was to evaluate the effect of a gabion installation and stream reconstruction in a 2km section of rechanneled stream. The Bushkill Creek, supporting a naturally reproducing brown trout population in Northampton County, PA, was sampled bi-weekly biologically, chemically and physically for sixteen months. Prior to the sampling, stream reconstruction efforts included both a gabion (rock current deflectors) installation to narrow and deepen the stream bed and tree and shrub planting to cover bare banks and provide eventual shade. The stream bed was open to sunlight and primary productivity, as evidenced by larger algae populations, increased in the rechanneled area. The following benthic macroinvertebrate parameters significantly increased also through the rechanneled area: diversity index, biomass, total numbers, and number of taxa. The following chemical parameters increased significantly through the rechanneled area: conductivity, dissolved oxygen, percent oxygen saturation and alkalinity. Orthophosphate decreased significantly and flow velocity increased significantly. Limestone springs contributed to the increase in conductivity and alkalinity. Increased photosynthesis and turbulence contributed to the increase in dissolved oxygen and oxygen saturation. The gabions deepened and narrowed the stream channel resulting in a cooler stream in summer.
W78-06410

AUTOMATIC MONITORING TECHNIQUES OF EUTROPHICATION SUBSTANCES IN COASTAL SEA WATER (FY 1976-1978), (SANGYO HAISUI NO FUEIYOKASEIBUN NO SHORI NI KANSURU KENKYU-KENSHUTAUKI HAIHATSU NI KANSURU KENKYU),
Government Industrial Research Inst., Osaka (Japan).
For primary bibliographic entry see Field 5A.
W78-06469

RESEARCH ON HYGIENIC CONDITIONS OF THE OLIVERI-TINDARI LAKE COMPLEX (MESSINA),
Messina Univ. (Italy). Inst. of Hygiene.
For primary bibliographic entry see Field 5A.
W78-06499

BIODEGRADATION OF SOME CATIONIC SURFACTANT AGENTS (BIODEGRADATION DE QUELQUES AGENTS DE SURFACE CATIONIQUES),
Monpellier-2 Univ. (France). Lab. d'Hydrobiologie.
For primary bibliographic entry see Field 5B.
W78-06507

QUALITY CRITERIA FOR WATER, JULY 1976.
Environmental Protection Agency, Washington, D.C. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5G.
W78-06527

LECTURES ON ESTUARINE CIRCULATIONS AND MASS DISTRIBUTIONS,
Johns Hopkins Univ., Baltimore, MD. Dept. of Earth and Planetary Sciences; and Johns Hopkins Univ., Baltimore, MD. Dept. of Mechanics and Materials Sciences.
For primary bibliographic entry see Field 2L.
W78-06538

ELUTRIATION STUDY OF WILLAMETTE RIVER BOTTOM MATERIAL AND WILLAMETTE-COLUMBIA RIVER WATER,
Geological Survey, Portland, OR. Water Resources Div.
J. F. Rinella, and S. W. McKenzie.
Open-file report 78-28, 1977. 8 p, 3 tab, 9 ref.

Descriptors: *Environmental effects, *Dredging, *Harbors, *Bottom sampling, *Oregon, Sediments, Columbia River, Mixing, Chemical analysis, Nutrients, Metals, Pesticides, Aquatic life, Evaluation, Bottom sediments, *Portland Harbor(Ore), *Willamette River(Ore), *Elutriate.

Bottom material from the Willamette River was collected and mixed with Willamette and Columbia River waters on May 17, 1977. The elutriate, as well as each sample, was analyzed for selected nutrients, metals, and pesticides. Results show that the average dissolved ammonia, manganese, and zinc concentrations would require dilution by receiving water to achieve aquatic-life criteria levels. (Woodard-USGS)
W78-06592

AQUATIC TOXICOLOGY AND HAZARD EVALUATION: PROCEEDINGS OF FIRST ANNUAL SYMPOSIUM ON AQUATIC TOXICOLOGY SPONSORED BY ASTM COMMITTEE E-35 ON PESTICIDES, 25-26 OCTOBER 1976, MEMPHIS, TENNESSEE.
American Society for Testing and Materials, Philadelphia, PA. Committee E-35 on Pesticides.

ASTM (Philadelphia, Pennsylvania) Special Technical Publication No. 634, 307 p, 1977. Mayer, F. L., and Hamelink, J. L., eds.

Descriptors: *Conferences, *Toxicity, *Water pollution, Pesticides, Hazards, Chemicals, Testing procedures, Bioassay, Model studies, Pollutants, Aquatic life, Environment, Safety, Water pollution effects, Benthos, Invertebrates, Fish, Polychlorinated biphenyls, Water quality, Dredging, Solid wastes, Waste disposal, Diets, Pulp wastes, Sulfite liquors, Oysters, Pulp and paper industry, Effluents, Lentic environments.

The 22 presentations by different authors deal with the philosophy and rationale of environmental safety and hazard evaluation of chemicals, especially new products; toxicity testing methods and approaches to bioassays; residue dynamics and modeling techniques; and biological effects of pollutants and interpretation of test results. A subject index and symposium are appended. (See W78-06609) (Brown-IPC)
W78-06608

EVALUATION OF THE EFFICACY OF SULFITE PULP MILL POLLUTION ABATEMENT USING OYSTER LARVAE,
Washington State Dept. of Fisheries, Brinnon.
R. D. Cardwell, C. E. Woelke, M. I. Carr, and E. W. Sanborn.
In: American Society for Testing and Materials, Special Technical Publication No. 634, p 281-295, 1977. 7 fig, 17 ref, 1 tab.

Descriptors: *Water pollution effects, *Oysters, *Sulfite liquors, *Pulp wastes, Water pollution sources, Wastes, Industrial wastes, Washington, Pulp and paper industry, Effluents, Water quality, Toxicity, Incineration, Waste water treatment, Larvae, Biological treatment, Aquatic life, Aquatic animals, Sulfite pulp mills, Puget Sound(Washington), Spent sulfite liquor.

Improvements in marine water quality attributable to treatment of effluents from two sulfite pulp mills (Scott Paper Co. and Weyerhaeuser Co.) were assessed in two regions of Puget Sound, Washington, from 1972 to 1975. The primary criterion for assessing water quality was its acute toxicity to larvae of Pacific oysters, Crassostrea gigas. Incineration of spent sulfite liquor drastically reduced the extent and range of receiving-water toxicity to these larvae. Thus, more than 30 sq km of receiving water near Everett, Washington, was highly toxic to the larvae in 1972 before spent sulfite liquor combustion, but only 1 sq km was similarly toxic in 1975 after installation of incineration equipment. These results suggest that secondary (biological) treatment may not be necessary to eliminate effluent toxicity, but further studies are needed regarding the effluent's effects on life cycles of sensitive indigenous aquatic species. (See also W78-06608) (Brown-IPC)
W78-06609

TOXICITY OF EFFLUENTS OF NOVEL BLEACHING PROCESSES,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong, M. Le Bourhis, R. A. Wostradowski, and S. Prahacs.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 248-1, Progress Report to March 31, 1974, 67 p, 16 fig, 29 ref, 2 tab, 6 append.

Descriptors: *Bleaching wastes, *Toxicity, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Biochemical oxygen demand, Color, Chemical oxygen demand, Water pollution effects, Fish, Aquatic animals, Pulp and paper industry, Effluents, Hardwood, Softwood, Kraft pulp, Resin acids, Wood extractives.

The fish toxicity, BOD, and color of bleach plant effluents using 9 novel (mostly 3-stage) sequences were evaluated and compared with effluents from conventional bleaching sequences. The stages included chlorination, caustic extraction, chlorine monoxide, chlorine dioxide, oxygen, ozone, hypochlorite, and peroxide in various combinations, as well as Cl/Cl dioxide mixtures and high-consistency gas-phase treatments. Few generally valid conclusions could be drawn from the results, but some interesting findings were obtained: Toxicity of chlorination effluents was greatly affected by the residual Cl content as measured immediately after Cl bleaching at 3% consistency. Except for the D/CE effluent, the toxicity was not significantly affected by the type of pulp (hard- vs. softwood kraft), nor was the C(D) stage effluent less toxic than a normal chlorination effluent. Alkaline-extraction effluents from 2 representative eastern hardwoods and 2 typical eastern softwoods showed nearly identical toxicities. Color, BOD, or COD were not useful parameters for toxicity prediction. As expected, color was much higher in softwood than in hardwood effluents. No simple correlation was evident between BOD or COD and the type of pulp or the bleaching sequence used. Resin acid content did not correlate with effluent toxicity. (Brown-IPC)
W78-06612

REDUCTION OF TOXICITY OF CONDENSATES FROM SULFITE WASTE LIQUOR EVAPORATORS,
Eco-Research Ltd., Pointe Claire (Quebec).
For primary bibliographic entry see Field 5D.
W78-06613

ASSESSMENT OF THE SENSITIVITY OF MAJOR AQUATIC FOOD CHAIN ORGANISMS TO NEWSPRINT MILL EFFLUENTS,
Eco-Research Ltd., Pointe Claire (Quebec).
A. Dumouchel, T. Matula, J. Reed, and M. A. Wilson.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 328-1, Final Report to March 31, 1975. 78 p, 10 fig, 16 ref, 16 tab.

Descriptors: *Pulp wastes, *Toxicity, *Fish food organisms, *Water pollution effects, Wastes, Industrial wastes, Water pollution sources, Canada, Foreign countries, Biological treatment, Chlorophyta, Algae, Zooplankton, Benthos, Aquatic algae, Aquatic life, Rainbow trout, Daphnia, Pulp and paper industry, Effluents, Bioassay, Invertebrates, Newsprint mills, Groundwood pulp, Kraft pulp.

Two newsprint mill effluents from eastern Canada, from furnishes containing groundwood and kraft pulps, were evaluated for toxicity, before and after secondary biological treatment, to two species each of green algae, zooplankta, and benthic macro-invertebrates. The untreated effluents, which were toxic to rainbow trout, were also toxic to Daphnia magna, Gammarus fasciatus, Selenastrum capricornutum, and Scenedesmus quadraicauda, and caused an avoidance reaction in Bithynia tentaculata. Treated effluents, which were not toxic to trout, caused reduced growth rates in the two green algae, but had no effects on the other species. Algae were not sensitive to linoleic and dehydroabietic acids (used as control substances) in concentrations up to 10 ppm. Acute-toxicity bioassays using Daphnia magna are simpler than those using Salmo gairdneri while giving readily correlatable results. (Brown-IPC)
W78-06614

REDUCTION OF THE TOXICITY TO FISH OF EFFLUENTS FROM PAPER MILLS,
Eco-Research Ltd., Pointe Claire (Quebec).
M. A. Wilson, R. LeBlanc, I. Middelraad, and P. J. LeBlanc.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 329-1, Final Report to March 31, 1975. 35 p, 10 ref, 9 tab.

Descriptors: *Toxicity, *Fish, *Pulp wastes, Wastes, Industrial waste, Water pollution sources, Pulp and paper industry, Effluents, Chemicals, Pigments, Dyes, Water pollution effects, Aquatic animals.

Effluents from two nonintegrated fine-paper mills were studied for fish toxicity. One effluent was nontoxic, but this mill generally used more water per ton of paper made than did the other which generated mildly toxic effluent. The cause of the toxic effect could not be related to the chemicals used in papermaking during the sampling periods. Because additives (pigments, sizes, fillers, dyes, etc.) are specific to each mill's operations, further studies of such complex process variables are not likely to give generally valid insights. (Brown-IPC)
W78-06615

EVALUATION OF THE EFFECTS OF EFFLUENTS FROM THE PULP AND PAPER INDUSTRY ON THE PRODUCTIVITY OF MARINE ALGAE,
Nova Scotia Research Foundation, Dartmouth.
K. Hellenbrand.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 370-1, Progress Report to March 31, 1976. 42 p, 31 fig, 4 ref, 2 tab.

Descriptors: *Pulp and paper industry, *Effluents, *Water pollution effects, *Marine algae, Wastes, Industrial wastes, Water pollution sources, Pulp wastes, Photosynthesis, Respiration, Toxicity, Fish, Ammonia, Sulfite liquors, Marine plants, Aquatic plants, Inhibition, Kraft mills, Sulfite pulp mills.

The aim of this study was to develop a simple method for measuring sublethal effects of pulp mill effluents in low concentrations on marine macro-algae (seaweeds). everal seaweed species were collected and incubated for periods upm to 14 days in aerated seawater containing 2,5 or 10% of effluent at 10, 15, or 20C. Both draft and sulfite mill effluents were used. and their effects were assessed by measuring photosynthesis (oxygen generation) and respiration (oxygen consumption) rates at intervals, using an oxygen probe, at a constant light intensity or in the dark. Most observed effects were small, but some cases of significantly changed photosynthesis or respiration rates were recorded. The effluent most toxic to fish at high concentrations, rarely reduced but often enhanced photosynthesis, particularly of Ulva lactuca. Reductions of respiration rates did not seem correlated with fish toxicity. All effluents significantly reduced the respiration of at least 2 seaweed species. It is concluded that pulp mill effluents probably act by two mechanisms, on inhibitory action caused by toxic components, another stimulatory action due to nutrients or activators. The two mechanisms counteract each other, so that toxic effects may be delayed. (Brown-IPC)
W78-06617

THE EFFECT OF CHEMICAL TREATMENT ON THE TOXICITY OF PULP AND PAPER MILL EFFLUENTS,
Beak Consultants Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5D.
W78-06619

WATER MANAGEMENT EFFECT OF THE PLZEN SULFITE PULP MILL SHUTDOWN (VODOHOSPODARSKY EFEKT LIKVIDACE SULFITOVE CELULOZKY V PLZNI),
Zapadoceske Papirny, Pilsen (Czechoslovakia).
For primary bibliographic entry see Field 5G.
W78-06630

TLM TEST OF TANNERY WASTE WATERS BY USING FISH,
Showa Women's Univ., Tokyo (Japan).
For primary bibliographic entry see Field 5A.
W78-06653

DISTRIBUTION OF DIPHYLLOBOTHRIASIS IN THE AREA OF THE GORKI WATER RESERVOIR, (IN RUSSIAN),
Gorkovskii Meditsinskii Inst. (USSR).
For primary bibliographic entry see Field 5B.
W78-06665

PHYTOPLANKTONIC ASSOCIATIONS OF SWEDISH LAKES,
Lund Univ. (Sweden). Limnological Inst.
E. Teiling.
Proceedings of the Seventh International Botanical Congress, Stockholm, Sweden, 1950. p 828-829.

Descriptors: *Bioindicators, *Phytoplankton, *Trophic level, *Sweden, *Lakes, Eutrophication, Oligotrophy, Mesotrophy, Desmids, Cyanophyta, Desmidieta, Protococcaleta, Myxophyceta, Algae, History.

A brief summary of a lecture concerns the association of certain types of phytoplankton with lake trophic status observed in some 600 lakes in southern Sweden. A continuous series of phytoplankton associations was developed, in relationship to lakes ranging from oligotrophic to eutrophic status. Main groups of associations are Desmidieta, Protococcaleta, and Myxophyceta. Certain stenotrophic leading forms are used as boundary marks of the secondary association; the presence or abundance of these forms characterizes the type of association. Most of the phytoplanktonic forms are eurytrophic, occurring in lakes of diverse trophic level. Optimal degree of trophy is indicated by abundance, and minimal degree by stunted growth. Leading forms, form oligotrophic to eutrophic, are: Dactylococcus ellipsoideus, Tabellaria flocculosa var. pelagica, Kirchneriella lunaris, Fragilaria crotonensis, Attheya zachariasi, Melosira granulata, Microcystis aeruginosa, M. viridis, and, in southern Scania on Mesozoic bedrock, Lyngbya contorta and Pediastrum kawraiskyi. Field studies showed that water of rocky basins in achaean bedrock contained small amounts of nutrients and had a small planktonic vegetation rich in desmids; in basins surrounded by clay, cultivated soil, and settlement, which had increasing nutrients, desmids decreased and planktonic protococcoid and cyanophyte algae increased. (Lynch-Wisconsin)
W78-06683

SOME MESOTROPHIC PHYTOPLANKTON INDICATORS,
Lund Univ. (Sweden). Limnological Inst.
E. Teiling.
Proceedings of the International Association of Theoretical and Applied Limnology, Vol. 12, 1955, p 212-215. 1 fig.

Descriptors: *Phytoplankton, *Bioindicators, *Mesotrophy, *Trophic level, *Algae, Sweden, Lakes, Eutrophication, Oligotrophy, Ecology, Soils, Altitude, Littoral, Vegetation, Desmids, Urbanization, History.

A correlation between phytoplankton composition and lake trophic level is based on observations in some 700 Swedish lakes. Stenotrophic plankters, with a pronounced limit toward the oligotrophic side of the spectrum, were selected as indicators. Mictoplanktic pseudo-associations were excluded. A general section of Sweden is fugured, from the alpine region (oligotrophic) and Archaean bedrock partly covered by moraine, to the lowland area of southern Scania (eutrophic) on Mesozoic bedrock covered by clay. The limit of clay sedimentation corresponds to the upper level of ice lakes and glacial sea. Indicators of extreme oligotrophy are the desmids Tabellaria flocculosa var pelagica and Dactylococcopsis ellipsoideus, strictly confined to oligotrophic lakes with rocky shores, very poor littoral vegetation, and no settlement. Desmid association without these two indicator species occurs in clear lakes in moraine soil lacking settlement. With decreasing oligotrophy the majority of planktic chlorococcales begin to occur, especially Kirchneriella lunaris. Towards the eutrophic side three diatoms appear: Fragilaria crotonensis, Attheya zachariasii, and Melosira granulata. In more eutrophic lakes certain eurytrophic Myxophyceae occur in summer, forming blooms; these include Aphanizomenon, Anabaena flos-aquae, and A. circinalis; with increasing eutrophy Microcystis aeruginosa and M. viridis appear. (Lynch-Wisconsin)
W78-06684

SOME LITTLE KNOWN SWEDISH PHYTOPLANKTERS,
Lund Univ. (Sweden). Limnological Inst.
E. Teiling.
Svensk Botanisk Tidskrift, Vol. 51, No. 1, 1957. p 207-222, 29 fig, 1 tab, 35 ref.

Descriptors: *Phytoplankton, *Sweden, *Lakes, *Dulcellieria, *Floral lists, *Classification, *Speciation, Algae, Oligotrophy, Coelastrum chodati, Lake Dammstugutjarn(Sweden), Lake Hallangen(Sweden), Lake Hemsjon(Sweden), Lake Valen(Sweden), Lake Mortsjon(Sweden).

Several phytoplankters found in Swedish lakes are noted, with special attention to the description of a new genus, Ducellieria. In 1915 Ducellier described a new alga, Coelastrum chodati, which the present author concludes does not belong in Coelastrum, but rather should be assigned to a new genus which he names Ducellieria. Ducellier's algal does not possess the regular numbers of cells found in the Coelastrum coenobium, the structure of cell bridges is quite distinct, and important generic differences are found in the protoplast. Two species of Ducellieria are recognized, D. chodati (with D. chodati var armata) and D. tricuspidata. D. chodati is eurytrophical and seems to be a summer plankter. Remarks on other algae include Calothrix brevissima, Gloeocystis gigas var pallida (from oligotrophic Lake Dammstugugolen(, Eutetramorus, Cosmarium boreale, and Spondylosium panduriforme. A table is included listing the planktonic algae found in Lakes Dammstugutjarn, Hallangen, Hemsjon, Valen, and Mortsjon. (Lynch-Wisconsin)
W78-06685

ON THE VARIATION OF MICRASTERIAS MAHABULESHWARENSIS F. WALLICHII,
Lund Univ. (Sweden). Limnological Inst.
E. Teilig.
Botaniska Notiser, Vol. 109, No. 2, 1956, p 260-274, 33 fig, 7 tab, 24 ref.

Descriptors: *Micrasterias mahabuleshwarensis f. Wallichii, *Phytoplankton, *Algae, *Lake Trysjon(Sweden), *Classification, Sweden Desmids, Eutrophication, Zinc, Water pollution effects, Lakes.

Plankton collected in little Lake Trysjon, Sweden contained a very rare desmid, Micrasterias mahabuleshwarensis f. Wallichii. Its richness in deviating forms and abundance inspired a detailed investigation. Lake Trysjon is a mildly eutrophic lake about 500 m by 150 m by 4 m deep in Ainkgruvan, Narke. The pH, which was 6.9-7.1 until 1947, increased to 7.3 when a nearby laundry began operation. Waste stone from a zinc mine has been used to partly fill the lake, and zinc concentrations of 0.6 mg/l are found in the water. Plankton samples were collected in the summers of 1943-45 and 1947-48. A total of 1238 specimens of M. mahab. f. Wallichii were collected. This study confirms its classification as a forma rather than a separate species. Two types appear in the samples: gracilis and robusta. The former has long conical processes, while the latter has shorter processes. The two types were connected by a complete series of intermediate forms. Most specimens were of the robusta type, but in 1944 the gracilis type strongly dominated. Dichotypical specimens consisting of one semicell of each type were not uncommon. It is possible that the difference is caused by varying light conditions. A striking diversity in certain details of M. mahab. leads to a general division into the europaea-type and the indica-type; distinguishing features are noted. (Lynch-Wisconsin)
W78-06686

STAURASTRUM PLACTONICUM ANS ST. PINGUE: A STUDY OF PLANKTONIC EVOLUTION,
Lund Univ. (Sweden). Limnological Inst.
E. Teiling.
Svensk Botanisk Tidskrift, Vol. 41, No. 2, 1947, p 218-234. 24 fig, 27 ref.

Descriptors: *Phytoplankton, *Staurastrum planctonicum, *Staurastrum pingue, *Bioindicators, *Classification, *Evolution, *Speciation, Sweden, Algae, Lakes, Staurastrum manfeldtii, Staurastrum sedbadi, Desmids, Oligotrophy, Eutrophication, Trophic level, Pelagic organisms.

The probable evolution of several plankters found in Swedish lakes is described, and some nomenclatory details are revised. Two evolutionary series are established: (1) Staurastrum manfeldtii to S. pingue with S. luetkemuelleri as an intermediate form, and (2) S. sebaldi var ornatum to S. planctonicum wiht S. sebaldi var ornatum forma planctonic as an intermediate form. S. manfeldtii var planctonicum is here transferred to S. sebaldi. S. luetkemuelleri is frequent in oligotrophic lakes; S. pingue has wider distribution, but is absent in most eutrophic and oligotrophic lakes; S. planctonicum has a more limited ecological range, and is found only in nearly eutrophic waters but not in the most eutrophic ones. The evolution of these pelagic forms appears to represent a tendency toward reduction of protuberances. As ornamentation signifies dead weight, pelagic conditions favor smoother forms, probably evolved through survival of the fittest. Both S. pingue and S. planctonicum are more pronounced plankters than S. manfeldtii and S. sebaldi var ornatum. Factors accounting for the advanced evolution of these plankters in Swedish lakes are discussed. (Lynch-Wisconsin)
W78-06687

PHYTOPLANKTON OF LAKE SHIWA NGANDU,
For primary bibliographic entry see Field 2H.
W78-06688

SEASONAL DISTRIBUTION OF VITAMIN B12 IN LAKE KINNERET,
Kinneret Limnology Lab., Tiberias (Israel).
B. Cavari, and N. Grossowicz.
Applied and Environmental Microbiology, Vol. 34, No. 2, p 120-124, August 1977. 3 fig, 24 ref.

Descriptors: *Vitamin B12, *Eutrophication, *Algae, *Lake Kinneret(Israel), *Phytoplankton, Israel, Bacteria, Lakes, Dinoflagellates, Peridinium, Bacillariophyta, Cyanophyta, Chlorophyta, Vitamins, Hypolimnion, Sediments, Limiting factors, Seasonal, Nutrients.

Examination of vitamin B12 content and its relationship to the distribution of algae and bacteria in the waters of Lake Kinneret, Israel, showed a positive correlation with Bacillariophyta and Chlorophyta and an inverse relationship with Cyanophyta. The onset of blooms of the dinoflagellate Peridonium coincided with increasing concentrations of B12, but persistence of

Peridonium after depletion of B12 suggests that the dinoflagellate is not dependent on the vitamin. This was corroborated by laboratory tests. The study was conducted February 1975 to March 1976. Vitamins have been suggested as major factors in controlling the appearance of algal blooms and the succession of algal populations, and dinoflagellates have been reported to be strongly dependent on B12. Bacteria are the main vitamin producers. The highest B12 concentration in the lake was about 100 ng/l recorded November-December 1975 at a depth of 40 m. The vitamin is formed in the hypolimnion and in sediment, and is liberated from the hypolimnion during turnover. The first increase of Peridonium occurred in February 1975 at high B 12 concentrations; Bacillariophyta and Chlorophyta also increased their biomass parallel to the B12 increase. During these months of isothermal conditions, however, concentrations of various nutrients (including B12) increase in the photic zone, and the increase in algal biomass could result either from nutrient or B12 increases or both. The B12 level may serve as a eutrophication indicator. (Lynch-Wisconsin)
W78-06690

DISTRIBUTION OF MYXOBACTERS IN AQUATIC HABITATS OF AN ALKALINE BOG,
Central Michigan Univ., Mt. Pleasant. Dept. of Biology.
L. A. Hook.
Applied and Environmental Microbiology, Vol. 34, No. 3, p 333-335, September 1977. 1 fig, 2 tab, 17 ref.

Descriptors: *Bacteria, *Myxobacteria, *Davis Lake(MI), *Alkaline water, *Bogs, Distribution patterns, Vestaburg Bog(MI), Lakes, Dissolved oxygen, Hydrogen ion concentration, Water temperature, Dominant organisms, *Michigan, Myxococcus fulvus, Species diversity, Sphagnum, Runoff.

Water and terrestrial samples taken in Davis Lake (Vestaburg Bog), an alkaline bog near Vestaburg in south-central Michigan, showed ten species of myxobacteria, including six species of the family Myxococcaceae. Myxococcus fulvus was dominant at all five aquatic sampling sites and comprised 54-90% of all observations. M. disciformis was relatively abundant in the fossa at the lake's margin, but few were found in other parts of the bog and none in soils surrounding the lake. Samples were obtained from five aquatic and three terrestrial sites September 1975-July 1976; pH, dissolved oxygen, and temperature were measured in-situ. Frequency of occurrence and diversity of aquatic myxobacter species was highest in aquatic sites associated with upland soils surrounding the bog, and lowest in the center and bottom of the lake. All species found in soil samples were also found in water samples, reflecting a high degree of runoff which washes nutrients and soil microorganisms into the bog. the 80 x 100 m lake occupies the bottom of a steeply-banked oblong basin. A quaking Sphagnum mat was 6.0-8.7, dissolved oxygen was nearly uniform (3.2-14.0 ppm) except in bottom sediments which were almost anaerobic (0.6-1.3 ppm), and temperature ranged from -2.0 to 15.0C. (Lynch-Wisconsin)
W78-06691

MERCURY IN THE LAKE POWELL ECOSYSTEM,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W78-06694

PREIMPOUNDMENT STUDY: CEDAR CREEK DRAINAGE BASIN: EVANS COUNTY WATERSHED: EVANS, TATTNALL, AND CANDLER COUNTIES, GEORGIA,
Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W78-06695

COPEPOD 2: A MARKOV-TYPE MODEL FOR COPEPOD POPULATION DYNAMICS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
L. A. Maguire, C. W. Gehrs, and W. Van Winkle.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL/TM-4976, Price codes: A06 in paper copy, A01 in microfiche. Publication No. 883, ORNL/TM-4976, July 1976. 97 p, 15 fig, 3 tab, 10 ref, 6 append.

Descriptors: *Copepods, *COPEPOD2, *Model studies, *Zooplankton, *Mathematical models, Animal populations, Population, Seasonal, *Oklahoma, Diaptomus clavipes, Egg mortality, Instars, Mortality, Ponds, Computer programs.

A model of copepod population dynamics, COPEPOD2, derived from the Leslie matrix and Markov theory, is described. Parameter values were estimated from data gathered during a one-year field study of Diaptomus clavipes in a small Oklahoma pond. The model consists of one compartment for each age class within an instar or instar group, and the number of compartments per instar corresponds to its duration in the life cycle. The number of copepods in each compartment is monitored through a one, one-half, or one-quarter day time step. Events in the annual life cycle are modelled as explicit seasonal functions, not as responses to environmental factors such as water temperature or food. In a preliminary version, population parameters (instar durations, mortality rates, clutch size) are assumed constant. The model output gives a plausible representation of annual changes in D. clavipes numbers following the temporal pattern and average magnitude of the field data, but does not reflect fluctuations around the mean. The model is most responsive to changes in egg mortality and clutch size. A modification permits use of submodels for calculating population parameters as functions of environmental factors. A disadvantage of COPEPOD2 is its lack of adult age structure, limiting adult mortality patterns to those that are independent of age. (Lynch-Wisconsin)
W78-06696

5D. Waste Treatment Processes

MANAGEMENT OF URBAN RUNOFF AND WASTEWATER IN THE OSLOFJORD AREA,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5G.
W78-06214

OPTIMIZATION OF A REGIONAL WATER RESOURCE QUALITY MANAGEMENT SYSTEM,
California Univ., Berkeley.
For primary bibliographic entry see Field 5G.
W78-06234

A METHOD FOR REMOVING SOLUBLE SELENIUM FROM ACIDIC WASTE WATER,
Department of the Interior, Washington, DC.
W. N. Marchant.
Available from Patent Office. Patent Serial No 596,117, July 15, 1975. 6 p, 2 tab.

Descriptors: *Zinc, *Mine wastes, *Mining, *Reduction(Chemical), *Waste water treatment, Water pollution, *Patents, *Selenium, Smelting operations, *Smelter effluent treatment, Scrub solutions, Reducing agents, Concentrating techniques.

Procedures for the removal of selenium from acidic scrub solutions (used in the treatment of zinc smelter effluent) are described. The waste water is treated with powdered zinc, an effective metallic reducing agent. The process may also be employed for removal of selenium from other aqueous wastes (such as those from copper refining processes, scrubber solutions from coal burning operations, etc.). Other metallic reducing agents such as iron or aluminum may be used. Two examples are provided for the concentration of soluble selenium from waste water. The performances of other reducing agents are compared in a third example. The government-owned invention described is available for licensing. (Seip-IPA)
W78-06260

INVESTIGATING WASTE OIL DISPOSAL BY DIRECT INCINERATION,
Army Mobility Equipment Research and Development Center, Fort Belvoir, VA. Petroleum and Materials Dept.
For primary bibliographic entry see Field 5E.
W78-06261

ASSESSMENT OF WASTEWATER MANAGEMENT, TREATMENT TECHNOLOGY, AND ASSOCIATED COSTS FOR ABATEMENT OF PCBS CONCENTRATIONS IN INDUSTRIAL EFFLUENTS. TASK II,
Versar, Inc., Springfield, VA.
G. Contos, R. L. Durfee, E. E. Hackman, III, and K. Price.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 433, Price codes: A13 in paper copy, A01 in microfiche. Final Report No EPA-560/6-76-006, February, 1976. 263 p, 43 fig, 58 tab, 10 ref, 5 append. 68-01-3259.

Descriptors: *Polychlorinated biphenyls, *Carbon, *Adsorption, *Waste water treatment, *Industrial wastes, *Capacitors, Recycling, Incineration, Landfills, Water pollution treatment, Air pollution, Solid wastes, Cost analysis, *PCB manufacturing process - Monsanto, *Ultraviolet ozonation, Transformers, Pretreatment.

A study was conducted of wastewater management and treatment technology available to determine toxic pollutant effluent concentrations and daily load achievable in 3 industrial categories: polychlorinated biphenyls (PCBs) and capacitor and transformer manufacturing. Under normal operating conditions, plants in these categories have PCB discharges to either waterways or sewage treatment plants and, under heavy rainfall conditions, to storm sewers or directly to waterways. Carbon adsorption technology is currently the best means of successful PCB removal. Although still in the research stage, ultraviolet-ozonation treatment offers potential of complete destruction of PCBs all the way to CO2, H2O and HCl. AMBERLITE polymeric adsorbents, also under development, have demonstrated a PCB removal efficiency roughly equivalent to carbon during laboratory testing. High temperature, controlled incineration is the best destruction means for scrap oils and burnable solid wastes generated at these plants; scientific landfilling is the best disposal method for nonburnable contaminated solids. Zero discharge objectives can best be achieved by eliminating discharge streams and developing recycle systems. Recommendations are: (1) all non-contact cooling water be segregated, cooled, and recycled, (2) all other wastewater streams be pretreated, and (3) the portion of the pretreated water which would be used in the plant be treated with carbon and the excess water be incinerated in a specially designed system which would allow for energy recovery. Supporting data, rationale for the selection of recommended treatment technologies, associated costs are included. (Seip-IPA)
W78-06262

GAS AND LEACHATE FROM LANDFILLS: FORMATION, COLLECTION, AND TREATMENT,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
For primary bibliographic entry see Field 5B.
W78-06263

STATEMENT FOR COMPREHENSIVE WATER POLLUTION CONTROL PROGRAMS,
Public Health Service, Washington, D.C. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 5G.
W78-06264

INVERTED SIPHONS FOR OIL TRAPPING,
Calspan Corporation, Buffalo, NY.
R. C. Ziegler, R. E. Baier, and D. J. Schuring.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 360, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/2/76-028, February, 1976. 63 p, 24 fig, 6 tab, 4 ref. 11020 DJG. WPRD 263-01-68.

Descriptors: *Oil pollution, *Siphons, *Sewers, *Model studies, Pollutant identification, Water pollution sources, Fluoride number, Gas chromatography, Telemetry, Fuels, *Inverted siphon sanitary system, Buffalo River Project(NY), Oil trapping, Oil detectors, Surface oils, Petroleum pollution, Infrared spectra emulsified oil, Fuel oils.

Investigations of the oil trapping characteristics and efficiency of an inverted siphon sewer system were conducted as part of a demonstration program for preventing and eliminating oil pollution in the Buffalo River. Analysis of samples taken from a full-scale system and tests conducted on 1/24 and 1/12 scale models reveal that the inverted siphon sanitary sewer design is nearly 100% effective for trapping surface oils including those that are constantly discharged into the sewer, e.g., cooking oils and greases and petroleum oils that enter as a result of accidental or deliberate discharges from gas stations, railroad refueling operations, and other industrial sources. The inverted siphon sewer configuration has nearly zero efficiency for trapping emulsified oils carried in the bulk waters of the sewer. Characterization studies revealed that most (70%) of the trapped oils were of petroleum origin. The petroleum-based fuels were diagnosed (on the basis of infrared spectra and gas chromatograms) as being essentially identical to No. 2 fuel oil, which was routinely used in railroad refueling nearby and was entering the Buffalo sewer line from an oil sump overflow in the railroad terminal. Oil detectors were developed and their use for both automatic and manual measurement of accumulated sewer oil depths are described; a telemetering system permitted oil data to be transmitted to a remote monitoring station several miles from the siphon via radio frequency link. (Seip-IPA)
W78-06268

AEROSOL PRODUCTION BY WASTE WATER SPRAY NOZZLES,
Brookhaven National Lab., Upton, NY.
For primary bibliographic entry see Field 5A.
W78-06270

LIQUIDATION OF THERMAL ELECTRIC POWER STATION WASTE WATERS - ACTUAL TECHNICAL PROBLEMS (ROUGH DRAFT),
V. P. Shvetsova, and S. D. Shcherbinina.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-tr-2982, Price codes: A02 in paper copy, A01 in microfiche. Report ORNL-tr-2983, (1974). Translation from Energetik, No 8, p 28, 1974. 7 p.

Descriptors: *Thermal powerplants, *Thermal pollution, *Water pollution treatment, Water purification, *Pollution abatement, *Water pollution control, Waste water treatment, Oil pollution, Thermal electric power.

Recommendations for the treatment, reduction, and prevention of thermal electric power station (TES) wastes are presented; they may be stated as follows: All thermoelectric stations should be constructed without external drainage. Water contaminated with petroleum products should be partially purified in petroleum traps and in mechanical filters; this partially purified water can be economically recycled and used in chemical rectification for irrigation of wet scrubbers, ash washout, and condenser cooling in the TES without damage to equipment. Systems for washing regenerative air pre-heater and boiler assemblies should be closed, i.e., waste-free. As neutralizing agent, ammonia formed in the sludge can be used to remove water from the filter cakes and would yield for metallurgical operations a solution free from iron, nickel, vanadium, and other metals. A thermal method should be applied in the preparation of diluent water for boiler supply. A heat and electric power plant should utilize a steam regenerator; the water supply to all pieces of equipment should be lime or soda-lime water. Feed water purification processes should use desalinated water which is free of iron. Blow-through water of the evaporator and steam regenerator should be well concentrated and the salt obtained sent to a processing point, buried or discharged to oceans. Water from hydrosol removal should be recirculated and blow-through water should be used for make up water to supply the evaporator and steam regenerator. Water, after chemical cleaning of the thermal power system or after its conservation, should be discharged into the hydrosol removal system and used as an additive in the cooling system. (Seip-IPA)
W78-06271

SANITARY AND ONCOLOGICAL ASSESSMENT OF AGRICULTURAL USE OF SEWAGE CONTAINING CARCINOGENIC HYDROCARBONS (ROUGH DRAFT),
Institut Eksperimentalnoi i Klinicheskoi Onkologii, Moscow (USSR).
For primary bibliographic entry see Field 5B.
W78-06275

MICROBIAL DEGRADATION OF PHENOLS IN THE PURIFICATION OF PHENOLIC WASTE WATERS WITH ACTIVATED SLUDGE,
Nauchno-Issledovatelskii Inst. Vodosnabdyavane Kanaliz. (Bulgaria).
V. Semov, and L. Andreeva.
Report ORNL-tr-2983, (1975). Translation from Sanit, Tekh. Vol. 8, No. 1, p 183-190, 1972. 7 p, 2 tab, 9 ref.

Descriptors: *Microbial degradation, *Biological treatment, *Activated sludge, *Phenols, *Biodegradation, *Microorganisms, *Oxidation, Chemical wastes, Domestic wastes, Waste water treatment, Water purification, Waste treatment, *Coke-chemical production wastes, *Biological oxidation, Resorcin, Pyrocatechol, O-cresol.

The ability of microorganisms (present in the activated sludge produced from the purification of domestic waste water) to decompose mono-and divalent phenols in coke-chemical plant waste waters was investigated. The biological oxidation of 4 phenolic compounds - phenol, o-cresol, pyrocatechol, and resorcin - was studied. In simultaneous purification of industrial phenolic waste water and domestic waste water in which the ratio of phenolic water to domestic water was gradually increased from 1:20 to 1:5 over an 8-month period. It was found that the number of strains of microflora which oxidize phenolic compounds increased. The microorganisms 'adapted' to increased portions of phenolated water through radical biochemical metabolic changes. With increased concentration of phenol, there was a marked increase in the ability of microflora to decompose phenolic compounds and in the number of species which do so. Phenol and pyrocatechol were most readily decomposed biologically. O-cresol and resorcin were oxidized less readily; hydroquinone was assimilated by only 2 of the 309 microbe strains isolated. (Seip-IPA)
W78-06276

WATER VAPOR DIFFUSION MEMBRANE DEVELOPMENT,
Ionics, Inc., Watertown, MA.
M. K. Tan.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-17827, Price codes: A04 in paper copy, A01 in microfiche. Final Report, NASA-CR-137804, January 1976. 68 p, 28 fig, 4 tab. NAS 2-7651.

Descriptors: *Water reuse, *Recycling, *Sewage treatment, *Membrane processes, Waste water treatment, *Vapor diffusion water reclamation unit(VDR), *Astronauts, *Space, *Water reclamation.

Polyvinyl chloride and cellophane membranes, used as phase separators in vapor diffusion water reclamation units (VDR) which recycle waste-water produced by astronauts in space are investigated. Eighteen different membranes were procured, characterized and tested in a modified bench-scale VDR unit. Four membranes were selected for further study of flux decline resulting from membrane fouling. The system was also investigated for low temperature application on wash water where the permeated water is not recovered but vented into space vacuum. Pretreatment does not significantly increase flux, product quality, or membrane fouling and should be omitted in future VDR designs; however, it is required to prevent wetting when using microporous hydrophobic membranes in the presence of a wetting agent such as soap. Permeate removal by vacuum is superior to removal by sweep gas. The VDR is effective for lower temperature of wash water in which the product water is vented to space vacuum; microporous hydrophobic membranes are not suitable for this application. The level of water removal from the urine charge should not exceed 80% (total solids should not exceed 15%) for best results. Turbulence promotion is required, especially when the charge concentration is relatively high. In the flat sheet configuration, 2-channel flow path with ridges is the preferred design for maximizing mixing and decreasing the boundary layer; the optimum pumping rate has not been determined. Ionics has developed a full-scale VDR unit for the treatment of various food products; this stack arrangement is briefly discussed. (Seip-IPA)
W78-06277

USE OF XANTHATES FOR THE REMOVAL OF METALS FROM WASTE STREAMS,
Goodyear Atomic Corp., Piketon, OH. Process Technology Dept.
M. E. Holland.
Available from the National Technical Information Service, Springfield, VA 22161 as GAT-826, Price codes: A02 in paper copy, A01 in microfiche. Report No GAT-826 October, 1975. 17 p, 2 fig, 5 tab, 17 ref.

Descriptors: *Chelation, *Metals, *Cellulose, *Waste water treatment, *Chemical precipitation, Sawdust, *Xanthates, *Cellulose derivatives, Straw, Corn starch.

The technical feasibility of producing large quantities of xanthate derivatives of corn starch, straw, sawdust, and cellulose filter cartridges, for use as metal chelating agents (to complex and precipitate metals from waste water solutions), was investigated. Xanthation of these materials was increasingly easier in the order of sawdust, straw,

starches, and pure cellulose; the capacity of the xanthates of these materials to remove dissolved metals from aqueous solutions was found to vary considerably as a result of their degree of xanthate formation. The cellulose filter cartridges and corn starch xanthates were the most efficient (removing 98-100% of the dissolved metals); the straw and sawdust xanthates removed 42-80% (an average of 30%) of the dissolved metals. Disadvantages of using xanthates for metal ions complexation and removal include: discoloration of the effluent, high effluent pH, objectionable odor caused by xanthate decomposition, limited capacity, the need for large amounts of wash water, the impracticality of large-scale synthesis, and the availability of better methods. (Seip-IPA)
W78-06278

DECONTAMINATION OF WATER CONTAMINATED WITH POLYCYCLIC AROMATIC HYDROCARBONS ((PAH) II. ACTION OF CHLORINE AND OZONE ON PAH DISSOLVED IN DRINKING AND RIVER WATER (ROUGH DRAFT),
Perugia Univ. (Italy). Inst. of Hygiene.
G. S. Sforzolini, A. Savino, and S. Monarca.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-tr-2961, Price codes: A01 in paper copy, A01 in microfiche. Report ORNL-tr-2961, (1974). Translation from Igiene Moderna, Vol 66, No 6, p 595-619, 1974. 5 fig, 13 tab, 27 ref.

Descriptors: *Oxidation, *Chlorine, *Ozone, *Water pollution treatment, *Aromatic compounds, Organic compounds, Potable water, *Polynuclear aromatic hydrocarbons, Pyrene, 3,4-bezopyrene, 3,4-benzofluoroanthene, 11,12-benzofluoranthene, 1,2-benzoanthracene, Doubly distilled water, Distilled water, River water, De-ionized water.

The oxidizing action of chlorine and ozone on 5 polycyclic aromatic hydrocarbons (PAH)-pyrene, 3,4-benzopyrene, 3,4-benzofluoroanthene, 11,12-benzofluoroanthene, and 1,2-benzoathracene - was investigated when dissolved in drinking, deionized, river and doubly distilled water. Ozone (at a concentration of 0.40 plus or minus 0.05 mg/l) oxidizes the PAH dissolved in all 4 types of water to a greater extent than does chlorine (at a concentration of 2 plus or minus 0.25 mg/l) for a 30-minute contact time. Most sensitive to treatment with chlorine and ozone in all types of water is 3,4-benzopyrene; the least sensitive is 3,4-benzofluoroanthene, which is particularly insensitive to chlorine. High variability in results (expressed as the standard deviation, the confidence interval, and the coefficient of variation) was encountered for ozonation and chlorination of river water and de-ionized water; low or zero variability was encountered in doubly distilled and drinking water. This is attributable to the variable nature and quality of river and de-ionized water and the nearly constant composition of doubly distilled and drinking water. Chlorine and ozone react with other constituents of river water, thus reducing their availability for reaction with the hydrocarbons under investigation. In chlorine treatment of pyrene and 3,4-benzopyrene dissolved in doubly distilled and de-ionized water, there are observable new spectrophotometric peaks in the ultraviolet and low visible ranges; this is probably due to the presence of chloride derivatives of these hydrocarbons. (See also W77-03369) (Seip-IPA)
W78-06279

COSTS OF RADIUM REMOVAL FROM POTABLE WATER SUPPLIES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. E. Singley, B. A. Beaudet, W. E. Bolch, and J. F. Palmer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 950, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA - 600/2-77-073, April, 1977. 139 p, 54 fig, 13 tab, 20 ref, 6 append. EPA R 803864-01.

Descriptors: *Radium radioisotopes, *Potable water, *Cost analysis, *Efficiencies, *Treatment facilities, *Ion exchange, *Reverse osmosis, *Lime, Capital costs, Operating costs, Maintenance costs, Annual costs, Radioactivity, Waste water treatment, Planning, *Radium removal methods, *Lime-soda softening.

In a guide for planners and water utility personnel in areas where radium exceeds EPA Drinking water Regulations limits, existing data on radium removal from potable water by lime-soda softening, ion exchange, and reverse osmosis treatment methods are analyzed; efficiency models to estimate capital, annual operating, and maintenance costs are proposed. No statistically significant correlation was found between raw water and radium activity levels and other quality parameters investigated, although a trend toward significance was noted between radium and iron, barium, and boron. Efficiencies of the 6 lime-soda softening plants studied varied from 59-96% radium removal and averaged 80%; radium removal varied nonlinearly with total hardness. The majority of radium activity removed appears in the dry waste sludge at levels approaching 100,000 pCi/kg; safe disposal of contaminated sludge is critical. Lime-soda softening is a cost-effective removal method, particularly at plant capacities above 10 MGD. Investigations at 8 ion exchange and 2 reverse osmosis plants demonstrated a potential 95% or greater efficiency from a well-operated plant (either type). In ion exchange plants, the majority of removed radium appears in the regenerated brine effluent (levels approaching 1000 pCi/l); about 9% of the radium activity remains in the exchange medium and is not regenerated. Reverse osmosis costs were higher than for other treatment processes; application should be limited to treatment of very brackish or very high radium-content raw water. Disposal methods for spent brine resulting from both ion exchange and reverse osmosis plants may be limited by salinity rather than radium activity levels. (Seip-IPA)
W78-06280

ELECTRO-REGENERATED ION-EXCHANGE DEIONIZATION OF DRINKING WATER,
Southern Research Inst., Birmingham, AL.
For primary bibliographic entry see Field 5F.
W78-06281

DEVELOPMENT OF A MOBILE TREATMENT SYSTEM FOR HANDLING SPILLED HAZARDOUS MATERIALS,
Envirex Inc., Milwaukee, WI. Environmental Sciences Div.
M. K. Gupta.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 707, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-109, July, 1976. 75 p, 22 fig, 16 tab, 20 ref, 2 append. 68-01-0099.

Descriptors: *Water pollution treatment, *Reverse osmosis, *Chlorination, *Carbon, Adsorption, *Flocculation, Sedimentation, *Filtration, Ammonia, Chlorinated hydrocarbon pesticides, Chlorine, Phenols, Organic compounds, Copper sulfate, *Waste spill treatment, On-site treatment, *Activated carbon adsorption, *Granular media filtration, Aluminum sulfate, Benzene, Acetone cyanohydrin, Acrylonitrile, Chlorinated hydrocarbons, Methanol, Tetraethyllead, Tetramethyllead, Water soluble organic wastes, Water soluble inorganic wastes, Chlorosulfonic acid, Formaldehyde, Mercuric chloride, Phosphorous penta-sulfide, Styrene.

Laboratory and engineering studies conducted to determine the design of a Mobile Hazardous Material Spills Treatment Trailer are documented. The Trailer and its main components (pumps, portable reaction and storage tanks, mixed media filters, activated carbon columns, etc.) are described; a summary of spill response capabilities are presented. The trailer is a mobile self-contained, modular filtration/carbon adsorption unit designed for on-site treatment of spilled hazardous water-soluble organics. Nine materials, selected on the basis of the priority ranking system developed by EPA, were evaluated: acetone cyanohydrin, acrylonitrile, ammonia, chlorinated hydrocarbons, chlorine, methanol, phenol, tetraethyllead (TEL), and tetramethyllead (TML). Several others were evaluated for treatment feasibility by reverse osmosis. The unit treatment processes of chemical reaction, flocculation, sedimentation, granular media filtration, and activated carbon adsorption formed the most suitable and versatile system for on-site removal and treatment of hazardous materials. A 12.6 l/sec (200 gpm) mobile system was constructed based on the design data outlined. Reverse osmosis can be utilized on a selective basis for the treatment of water soluble inorganics but is unsuitable for many materials because of their low water solubility and effect on membranes. Optimum processes (including activated carbon adsorption, chlorination, coagulation, filtration, and physical-chemical methods) are outlined for treatment of acetone cyanohydrin, acrylonitrile, chlorine, phenol, ammonia, pesticides, herbicides, methanol, TEL, and TML. (Seip-IPA)
W78-06283

COMBINATION OF AN ELECTROLYTIC PRETREATMENT UNIT WITH SECONDARY WATER RECLAMATION PROCESSES.
McDonnell-Douglas Astronautics Co., Santa Monica, CA. Biotechnology and Space Sciences Dept.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-17828, Price codes: A10 in paper copy, A01 in microfiche. Report No. NASA-CR-147448, 1976. 195 p, 39 fig, 21 tab, 9 ref, 3 append. NASA-JSC-NASI-11781.

Descriptors: *Waste water treatment, Pre-treatment(Water), Potable water, *Polyelectrolytes, *Urine, Evaporation, Carbon, *Electrolysis, Water reuse.

An electrolytic pretreatment unit with secondary water reclamation processes was designed, fabricated, and verified for operation in conjunction with an air evaporation unit for the recovery of potable water from human urine. The electrolytic-evaporation system is an automated, six-man, flight-concept prototype, designated Electrovap. The electrolytic pretreatment unit removes partial organics from urine. The air evaporation unit then distills and evaporates the urine for emoval of remaining organics and inorganic salts. The system is self-sterilizing and was developed for space missions of medium to long-term duration. Fail-safe control features ensure safe unattended operation. The integrated system was operated for testing for a five day period, during which 108.5 lb or urine and 27.1 lb of flush water were processed. Only minor malfunctions were noted, verifying the feasibility of the concept. Pretreatment reduced average total organic carbon concentration to 778 ppm; evaporation produced water with an average total organic carbon concentration of 10,42 ppm, low conductivity, and average total dissolved solids content of less than 1 ppm. Product water met all standards for potable water with the exception of pH. The Electrovap system was concluded to be suitable for recovery of potable water human urine with minor adjustments recommended. The appendices contain information on subtasks (failure modes, evaluation, specifications). (Wares-IPA)
W78-06285

MERCURY RECOVERY FROM CONTAMINATED WASTE WATER AND SLUDGES,
Georgia-Pacific Corp., Bellingham, WA. Bellingham Div.
R. Perry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-238 600, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-660/2-74-086, December, 1974. 119 p, 29 fig, 28 tab, 61 ref, 4 append. 12040, HDU, 1BB037.

Descriptors: *Water pollution, *Metals, *Sludge disposal, *Waste water treatment, *Mercury, Sulfides, Chemical precipitation, Hydrogen sulfide, Filtration, Electrolysis, Activated carbon, Ion exchange, Reduction(Chemical), Particle size, Oxidation, Chlorination, Reclamation, Separation techniques, *Chlor-alkali cells, Resource recovery, Clarification, Thickening, Roasting, Vacuum filtration.

A plant was designed, built, and installed to remove Hg from waste water and sludge produced by a mercury cell chlor-alkali plant. Hg content of the waste water ranged from 300 to 18,000 ppb mercury, while content of the brine sludge ranged from 150 to 1,500 ppm. Other sludges (Hg content 10 to 25 ppm) processed were from the waterway near the plant outfall. Sulfide precipitation system achieves effluent Hg levels ranging from 10 to 125 ppb for an 87 to 99% removal, handling up to 280 liters/minute adequately with a 48-hour cycle between backwashings. Capitol cost is $143,900 and operating costs are $.50/3,785 liters. The sludge system comprising collection system, a thickener, a vacuum filter, multiple hearth furnace, and condensers processes 140 to 320 kg/hour dry sludge. From feed mercury cntent ranging from 290 to 440 ppm, clinker mercury content after treatment contains from 0.5 to 7.2 ppm (removal rate of 98.3 to 99.890). Waterway sediments are also treated in the sludge system at 87 to 92% efficiency of mercury removal. Capital cost of the sludge system is $365,500; operating costs are $32/metric ton of dry sludge treated. Advantages include: process steps, pH range compatibility with total plant effluent, concentrated mercury products, inexpensive chemicals, and minimal environmental stress. Application of the treatments to wastes from other chlor-alkali plants is recommended, with refinements for cost efficiency improvement. Appendices descibe oxidation process, determination of Hg, experimental data, and an operating manual for the system. (Wares-IPA)
W78-06286

SEWAGE FACILITIES CONSTRUCTION REPORT, 1971.
Environmental Protection Agency, Washington, DC. Water Quality Analysis Branch.
For primary bibliographic entry see Field 5G.
W78-06287

SEWAGE FACILITIES CONSTRUCTION REPORT 1972, 1973, 1974.
Environmental Protection Agency, Washington, DC. Point Source Analysis Branch.
For primary bibliographic entry see Field 5G.
W78-06288

MUNICIPAL SLUDGE MANAGEMENT: EPA CONSTRUCTION GRANTS PROGRAM. AN OVERVIEW OF THE SLUDGE MANAGEMENT SITUATION,
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W78-06290

COST ESTIMATES FOR CONSTRUCTION OF PUBLICLY-OWNED WASTEWATER TREATMENT FACILITIES. 1976 NEEDS SURVEY, (REPORT TO CONGRESS).
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W78-06291

FLUORIDE EMISSIONS FROM PHOSPHORIC ACID PLANT GYPSUM PONDS,
North Carolina State Univ. at Raleigh.
For primary bibliographic entry see Field 5A.
W78-06292

STATISTICAL SUMMARY, 1968 INVENTORY, MUNICIPAL WASTE FACILITIES IN THE UNITED STATES,
Federal Water Quality Administration, Washington, DC. Div. of Technical Support.
For primary bibliographic entry see Field 5G.
W78-06293

DEVICES FOR ONBOARD TREATMENT OF WASTES FROM VESSELS,
Thiokol Corp., Brigham City, UT. Wasatch Div.
T. J. O'Grady, and P. E. Lakomski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 993, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-670/2-74-091, December 1974. 117 p, 39 fig, 15 tab, 2 ref, 2 append. ROAP 21APK, 68-01-0115.

Descriptors: *Sewage treatment, *Sludge disposal, Ships, *Filtration, *Incineration, *Chlorination, *Cost analysis, Physicochemical properties, Waste water treatment, *Zero discharge waste treatment.

A program involving the demonstration of a pleasure craft zero discharge, physical/chemical waste treatment system, which employs a unique filter-incinerator device, was conducted. Test data from laboratory and shipboard demonstration tests are presented, as well as data on manufacture and installation costs. The system utilizes processes for filtration of influent waste to remove coarse and suspended solids, incineration of collected coarse and suspended solid material, and chemical treatment of the collected filtrate to reduce biochemical oxygen demand prior to discharge. During the development period, a no-discharge standard was adopted by EPA, and the development program was redirected to develop a system which would totally prevent discharge of waste. After installation and use of the developed system to handle wastes of over 300 persons on a houseboat during the summer boating season of 1973, analysis of the recycled liquid showed a zero coliform bacteria count (making the treated water acceptable for reuse as flush water. The economics of the system were also demonstrated. The program demonstrated that a device combining two unit operations (filtration and incineration) can effectively and safely remove and destroy sewage sludge, and can be adapted with minor modifications to installation on commercial vessels. (Wares-IPA)
W78-06294

EXPLOSIVES REMOVAL FROM MUNITIONS WASTEWATERS,
Rohm and Haas Co., Philadelphia, PA.
B. W. Stevens, R. P. McDonnell, R. K. Andren, and J. M. Nystrom.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A015 602, Price codes: A03 in paper copy, A01 in microfiche. Report No. 290131, 1975. 25 p, 12 fig, 1 tab, 6 ref. Presented at the 30th Annual Purdue Industrial Waste Conference, Lafayette, Indiana, May 6-8, 1975.

Descriptors: *Industrial wastes, *Adsorption, *Waste water treatment, Pilot plants, Iowa, Chemical wastes, Hazards, Polymers, Burlington(IA), Munitions, Ordinance.

Pilot plants studies conducted at the Iowa Ammunition Plant, Burlington, Iowa, have demonstrated a safe, practical, and economical polymeric adsorption process for removing trinitrotoluene (TNT) and other hazardous explosive materials, such as DNT and nitrocresols, from waste streams. The absorbents consist of hard, insoluble, porous resin beads formed from copolymers of styrene and divinylbenzene or acrylic esters. Having a high surface area to weight ratio, the beads employ Van der Waals forces to absorb many water soluble organics. The process is also reversible, so that absorbed organics can be desorbed from the surface of the resin by polar organic solvents. The absorbent also can be effectively regenerated to restore its original capacity, and the solvent regenerant can be reclaimed for reuse, leaving only a concentrated aqueous sludge of explosive contaminants for ultimate disposal. As a result of the success of the pilot-scale study, full-scale demonstration installations of the process are being planned for several ordinance plants in the United States. The same process is equally applicable to industrial waste streams containing aromatic nitrobodies. (Wares-IPA)
W78-06295

STUDIES ON MUST FIELD HOSPITAL WASTEWATER TREATMENT,
Army Mobility Equipment, Research and Development Center, Fort Belvoir, VA. Sanitary Sciences Div.
J. G. Vlahakis.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A008 963, Price codes: A04 in paper copy, A01 in microfiche. Report No. 2121, December, 1974. 54 p, 15 fig, 16 tab, 11 ref, 2 append. 1G762708AH67. Intra-Army Order 4720.

Descriptors: *Waste water treatment, *Polyelectrolytes, Carbon filters, Reverse osmosis, Hospitals, Coagulation, *Treatment facilities, Powdered carbon, Medical Unit Self-Contained Transportable(MUST).

An investigation was carried out on applicability of using polyelectrolyte-aided-carbon coagulation as a pretreatment in combination with a high-recovery reverse osmosis (RO) system to treat a synthetically prepared Medical Unit, Self-Contained, Transportable (MUST) hospital wastewater possessing variable characteristics. The five-source hospital waste consisted of X-ray, operating room, laboratory, shower, and kitchen waters. Two powdered carbons and four different cationic and anionic polymers were tested. Turbidity reductions of the treated waters reached as high as 97%, and total organic carbon removals averaged about 50%. Based on these results, a 10,000 gpd pilot plant was tested on a 200 hour basis (100 consecutive hours per run) to evaluate its performance by these parameters: total organic carbon removal, turbidity, pH, chemical oxygen demand, linear alkyl sulfonates, total hardness, total alkalinity, suspended solids, conductivity, silver, chromium, zinc, and RO flux and salt rejection. The principles of the completed system involved polyelectrolyte-aided carbon coagulation, upflow clarification, diatomaceous earth filtration, and demineralization by spiral-wound RO. The MUST wastewater was adequately treated by this process; dosages of 1000 mg/l Nuchar A and 100 mg/l Cat-Floc were successful in the field. The appendices contain the MUST wastewater formula and results of MUST water jar tests. (Wares-IPA)
W78-06296

PROCEEDINGS OF THE BIOCONVERSION ENERGY RESEARCH CONFERENCE HELD AT MASSACHUSETTS UNIVERSITY, AMHERST ON 25-26 JUNE 1973.
National Science Foundation, Washington, DC. Research Applied to National Needs.
For primary bibliographic entry see Field 5E.
W78-06298

A MODEL FOR MULTI-PERIOD REGIONAL WASTEWATER PLANNING,
North Carolina Univ. at Chapel Hill.
For primary bibliographic entry see Field 5G.
W78-06299

GUIDANCE REGARDING THE SETTING UP OF ENCAMPMENT HYGIENE AT A PERMANENT ENCAMPMENT AREA (OHJE LEIRIHYGIENIAN JARJESTELYSTA PYSYVILLA LEIRIALUEILLA),
Research Center of the Defence Forces, Helsinki (Finland).
M. Waris, and J. Rasi.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 082, Price codes: A02 in paper copy, A01 in microfiche. Report No. USAMIIA-K-6744, July, 1976. 13 p, 2 fig. Translated from Finnish.

Descriptors: *Sanitary engineering, *Sewage treatment, Waste disposal, Human population, Community development, Facilities, *Encampment hygiene.

Directives and recommendations are presented for use in determined proper placement of lodging and servicing areas on terrains for which the daily load exceeds 200 men. The placement guidance deals with resolving problems related to housekeeping centers and/or lodging areas of companies; field latrines, solid wastes, and wastewater are treated. Provisions are made for hygienic standards in water supply, nutritional provisions (preparation, transport, storage, and housekeeping), garbage handling (solid refuse, wastewater, and latrines), saunas and swimming beaches, vehicle maintenance stations, and environmental protection. (Wares-IPA)
W78-06300

SYMPOSIUM PROCEEDINGS: ENVIRONMENTAL ASPECTS OF FUEL CONVERSION TECHNOLOGY, II (DECEMBER 1975, HOLLYWOOD, FLORIDA).
Research Triangle Inst., Research Triangle Park, NC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 182, Price codes: A17 in paper copy, A01 in microfiche. Report No. EPA-600-2-76-149, June, 1976. 403 p, 167 fig, 88 tab, 286 ref, append. EHB529, 68-02-1325.

Descriptors: *Environmental effects, *Fuels, Technology, Control, Measurement, Conferences, *Fuel conversion, Processes.

Proceedings of the symposium on environmental aspects of fuel conversion technology held December, 1975, in Hollywood, Florida, are presented. The objective of the symposium was to review and discuss environmentally related information in the field of fuel conversion technology. Specific topics addressed were environmental problem definition, process technology, control technology, and process measurements. (See W78-06303 thru W78-006307) (Wares-IPA)
W78-06302

COAL CONVERSION PROCESS WASTEWATER CONTROL,
McKee (Arthur G) and Co., Cleveland, OH.
W. A. Parsons, and R. A. Ashworth.
In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology, II (December 1975, Hollywood, Florida), p 225-231. 3 fig, 1 tab, 5 ref.

Descriptors: *Coals, *Effluents, Pollutants, Pollutant identification, Pollution abatement, Recycling, Wastewater disposal, Control, Environmental effects, *Fuel conversion, Recovery, Residuals.

Principal wastewater generating processes are identified from various unit operations incorporated in the process sequence of coal conversion plants. The magnitude and characteristics of the effluents expected from various coal conversion processes are described; these discharges are potentially highly pollutional unless wastewater control is engineered into the production facility. Process-oriented effluent control alternatives, which exploit the prospects for process revision, recovery, recycle, and serial reuse, are presented. Treatment-oriented effluent control concepts are analyzed for applicability to wastewater disposal situation. Technical problems associated with the implementation of wastewater control are discussed, and the expected performance of the wastewater control concepts are evaluated in terms of contributions of pollutants and residuals (See also W78-06302) (Wares-IPA)
W78-06303

A TAPERED FLUIDIZED-BED BIOREACTOR FOR TREATMENT OF AQUEOUS EFFLUENTS FROM COAL CONVERSION PROCESSES,
Oak Ridge National Lab., TN.
C. D. Scott, C. W. Hancher, D. W. Holladay, and G. B. Dinsmore.
In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology, II (December 1975, Hollywood, Florida), p 233-240. 3 fig, 2 tab, 9 ref.

Descriptors: *Environmental effects, *Biological treatment, Fluid mechanics, Microbiology, Degradation(Decomposition), Microorganisms, Biomass, Aerobic bacteria, *Fuel conversion, *Processes, Residuals, Bioreactors, Fluidized bed.

A bioreactor system based on a tapered fluidized bed is under development for the microbiological degradation of hazardous organic compounds expected in aqueous effluent waste streams from coal conversion processes. Such a system will be used with fluidized reaction medium alleviates operational problems associated with biomass buildup and allows easy removal or addition of the active materials. The tapered reactor tends to stabilize the fluidized bed while allowing a much wider range of operating conditions. Preliminary experimental results from a study made with a three inch diameter tapered fluidized bed reactor that contained adhering Pseudomonas bacteria and operated aerobically indicate that the phenol content of a feed stream can be reduced to less than 25 ppb. This concept is compatible with multistage operation, and scale-up is considered practical. (See also W78-06302) (Wares-IPA)
W78-06304

CLIMATIC EFFECTS ON WASTEWATER TREATMENT,
North Dakota State Univ., Fargo. Dept. of Civil Engineering.
S. L. Klemetson.
In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology, II (December 1975, Hollywood, Florida), p 241-251. 10 fig, 8 tab, 3 ref. ENG7510251.

Descriptors: *Climates, *Waste water treatment, Fuels, Water pollution, Biology, Pollutants, Facilities, Design, Path of pollutants, Coal gasification, Synthetic fuels.

Principal factors of the climate (temperature, solar radiation, heating days, wind roses, precipitation, and snowfall) are discussed in their relationship to wastewater treatment processes. Since the development of coal gasification processes to produce synthetic natural gas is expected to create potential pollution problems, the sources of pollutants at the site and basic constituents of the waste streams are described. The wastewaters are generally treated in several typical physical, chemical, and biological treatment processes. The effects of temperature variations on biological reaction rates, biological oxygen demand, removals, and detention times are estimated. It is recommended that more concern be placed on the effect of climatic conditions on wastewater treatment design, so that the potential for added pollution of water can be averted. It is considered that the physical and electrical design aspects require special attention to prevent malfunctions of their operations. The climate of a given area is concluded to affect the selection of the treatment sequence, which is chosen in terms of desired effluent limitations. (See also W78-06302) (Wares-IPA)
W78-06305

WASTE MANAGEMENT OF FUELS PROCESSING EFFLUENTS,
Exxon Research and Engineering Co., Florham Park, NJ.
G. W. Grove.
In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology, II (December 1975, Hollywood, Florida), p 253-258. 6 fig.

Descriptors: *Fuels, *Waste water treatment, *Industrial wastes, Industrial water, Waste disposal, Technology, Energy, Economics, Sludge, Separation techniques, *Refineries.

Technology developed in the past several years for refinery wastewater treatment sludge concentration is described. It is speculated that refining of hydrocarbon fuels results in wastewater streams containing hydrocarbons, solids, and water. These contaminants must be removed from the water prior to discharge or reuse. Whether resulting from synthetic or conventional fuels refineries, the techniques for concentration and disposal of waste hydrocarbons and solids should be much the same. These techniques involve a series of concentration steps resulting in a reduced volume of sludge that can be treated in the lowest cost environmentally acceptable manner. The advantages of the new technology developed for such treatment sludge concentration include: less energy consumption, lower investment and operation cost, higher sludge concentration that reduces final sludge treatment or disposal cost, and improved separation of waste and water. (See also W78-06302) (Wares-IPA)
W78-06306

WATER REQUIREMENTS FOR AN INTEGRATED SNG PLANT AND MINE OPERATION,
Water Purification Associates, Cambridge, MA.
For primary bibliographic entry see Field 3E.
W78-06307

INTERACTION OF URBAN STORMWATER RUNOFF, CONTROL MEASURES AND RECEIVING WATER RESPONSE,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 5B.
W78-06309

PROCESS MODIFICATIONS OF AEROBIC DIGESTION FOR PRODUCT STABILITY AND NITROGEN CONTROL,
Colorado Univ., Boulder.
R. B. Hartman.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-24,227. PhD Thesis, 1977, 223 p.

Descriptors: *Waste water treatment, *Biological treatment, *Aerobic treatment, *Sludge digestion, *Stability, Municipal wastes, Treatment facilities, Sludge, Nitrates, Nitrogen.

Aerobic digestion was evaluated for reducing odor and nitrate contamination problems associated with land application of sludges from waste water

treatment. Laboratory-scale studies indicated that biological oxidation of nitrogenous material in the sludge provided greated flexibility in sludge nitrogen control. The maximum digestion rate occurred near 30C. Product stability increased with detention time. The degree of stability depended strongly on a small biodegradable fraction that was oxidized shortly before the end of the digestion process. Additional alkalinity, which could be introduced by including a reactor for biological dentrification in the aerobic digestion sequence, was needed to maintain conditions favorable for completion of the nitrification reactions. Aerobic digestion of waste water sludges was considered viable, yielding a product which was highly stable and suitable for land application. (Snyder-FIRL)
W78-06316

EFFLUENT QUALITY VARIATION AT DIFFERENT ORGANIC LOADINGS WITH MULTICOMPONENT SUBSTRATE IN THE ACTIVATED SLUDGE PROCESS,
Vanderbilt Univ., Nashville, TN.
S. Siber.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-30373. PhD Thesis, 1977, 173 p.

Descriptors: *Activated sludge, *Organic loading, *Phenols, *Carbon, *Sulfur compounds, Model studies, Organic matter, Organic compounds, Waste treatment, Sludge treatment, Municipal wastes, Analytical techniques.

Parameters of substrate removal by activated sludge were examined in laboratory tests with a synthetic, organic multicomponent substrate used to simulate waste water. The substrate, a mixture of glucose, phenol, and sulfanilic acid, was treated with activated sludge in a continuous flow, completely-mixed laboratory-scale reactor. Parameters observed during the treatment process were the removal of substrate as measured by total organic carbon, removal at four food-to-microorganism ratios, influent and effluent quality, and the effect of sludge age on substrate removal. Combinations of the phenol, glucose, and sulfanilic acid were varied to more accurately approximate the removal, biodegradability, and influent concentration of each substrate. Overall removal rates were found to be the sum of the single substrate removal rates when analysed in terms of total organic carbon. A kinetics model was used to show the relationship of the parameters to effluent quality. (Lisk-FIRL)
W78-06322

DETERMINING THE ECONOMICS OF FILTER CAPPING,
J. H. Larson, and R. D. Letterman.
Water and Sewage Works, Vol. 124, No. 11, p 94-96, November 1977. 1 fig, 3 tab, 2 ref.

Descriptors: *Filter capping, Economics, *Optimization, *Waste water treatment, *Filtering, *Alternative costs, Effluents, Water pollution control, Equations, Filters, Sand filters, Anthracite, Coals, Electric power costs, Costs, Backwashing, Treatment facilities.

Unless chemical or electrical costs are inordinately high, capping of sand filters in wastewater treatment is an economical alternative only for plants using more than 5% of total plant pumpage for backwashing. Filtering mediums of granular bed filters should ideally store a large quantity of filtered solids with minimum head loss development, be readily cleaned by backwashing, and produce an effluent of acceptable quality. Compromises must be made in filter design since these requirements are not consistent. Current use is mainly of dual-media filters, consisting of a coarse anthracite layer on top of a layer of sand. Many conventional single-medium sand filters are being converted into dual-media filters through capping, in which, for example, a six-inch layer of sand is replaced by six inches of anthracite coal. Studies at filtration plants on Lake Michigan indicated that the capped filters permitted run lengths two to four times as long as sand-only filters, and effluent turbidity was about equal. Processed water is used to backwash a sand filter, and the increase in filter run length resulting from capping a sand filter is directly proportional to the savings in backwash water, provided the same quantity of water is required per backwash (which appears to be the case). Total plant pumpage is equal to consumer demand plus backwash water requirements. (Lynch-Wisconsin)
W78-06325

TECHNOLOGICAL ECONOMICS APPLIED TO WASTE RECOVERY AND TREATMENT PROCESSES,
Aston Univ., Birmingham (England). Dept. of Chemical Engineering.
A. V. Bridgwater.
Effluent and Water Treatment Journal, Vol. 17, No. 9, p 467-473, September 1977. 5 tab, 6 ref.

Descriptors: *Economics, *Waste treatment, *Capital costs, *Recycling, *Waste disposal, Costs, Technology, Taxes, Investment, Incentives, Marketing, Depreciation, Financing, Operating costs, Energy, Pollution abatement, Labor, Raw materials, Equipment, Planning, Treatment facilities.

As part of a series on economics of waste recovery and treatment processes, information is given for making rough estimates of capital costs. A table gives models for estimating costs of processes and operations (in British pounds), as of January 1977. Where economy of scale is limited, only a single cost is quoted, but usually at a stated capacity. Mixed process costs may be determined by adding together component costs. Cost models include liquid effluent treatment, solid waste treatment, gaseous emissions, deep well injection, chimney stacks, and lagoons or reservoirs. Additional tables provide equivalent data for equipment based on delivered costs and overall disposal and treatment costs, including both capital and operating costs. Economies of scale are not included in the latter. Constituent elements of operating costs are conventionally estimated as functions of raw materials, labor energy, fixed investment-related costs, and selling price; each of these factors is discussed in the text. Other aspects discussed are: depreciation, investment incentives, taxation, and markets for recovered materials. For the domestic refuse materials recovery industry, the potentially most valuable materials to recover are metal fractions; but as these tend to be relatively impure, not only will the price be low, but the scrap may not be recyclable by usual methods. (Lynch-Wisconsin)
W78-06327

ANNUAL REPORT, 1973, INSTITUTE FOR WASTE REMOVAL (SVA), THE NETHERLANDS.
Institute for Waste Removal (SVA), Amersfoort (Netherlands).
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 075, Price codes: A05 in paper copy, A01 in microfiche. Report EPA TR76-434, 1974. 92 p, 16 fig, 4 tab, 31 ref, 2 append. Trans by EPA, Research Triangle Park, N.C.

Descriptors: *Waste water disposal, *Waste water treatment, *Waste disposal, *Waste dumps, *Waste treatment, Sewage treatment, Sewage effluents, Research and development, Heat, Pollutant indentification, Cost analysis, *Combustion, Netherlands.

Institute activities for 1973 are reported. Topics include: (1) waste processing, removal, and dumping recommendations for municipalities and facilities; (2) testing procedures and results; (3) reports of working groups and commissions; (4) collection of data on quantities and nature of waste materials; (5) coordination of and participation in research activities; (6) visits to plants; (7) conferences and symposia; (8) lectures given; (9) recommendations and advice; (10) representations and attendance; (11) ancillary organizations; and (12) publications in journals. Three complete reports are included: (1) Energy from Wastes - a discussion of the use and cost benefit of refuse combustion-generated heat as an electricity and heating source, (2) Removal of hexavalent chromium poisons using activated charcoal columns, and (3) The combined processing of purification mud (mud which results from purification of household and similar types of non-toxic industrial wastewater) and solid wastes. (Seip - IPA)
W78-06343

CLEANING COAL WITH COAL: COAL HUMIC ACIDS FOR REMOVAL OF ACIDS, ALKALI, SALINITY, AND HEAVY METAL POLLUTANTS ASSOCIATED WITH THE USE OF COAL AS A FUEL,
Missouri Univ.-Columbia. Dept. of Chemistry.
S. E. Manahan, J. B. Green, J. Godwin, and B. Ting.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 580, Price codes: A09 in paper copy, A01 in microfiche. Missouri Water Resources Research Institute, Rolla, Completion Report, February 15, 1978. 178 p, 17 fig, 32 tab, 141 ref, 3 append. OWRT B-115-MO(2), 14-31-0001-4170.

Descriptors: *Humic acids, *Fly ash, *Coals, *Water pollution treatment, *Air pollution, *Coal combustion effluents, *Gas scrubbers, Sulphur dioxide, Combustion.

The use of humic acid (HA) (a constituent of low rank coal) and fly ash (FA) as potential scrubber chemicals for the treatment of water pollution arising from coal combustion effluents is investigated. HA is characterized and purification processes are described. Cation binding by HA is believed to occur via 3 main mechanisms: (1) ortho-phenolic-carboxylic chelation, (2) intra- and intermolecular exchange of acidi groups having appreciable acidity, and (3) exchange following hydrolysis of groups on HA. The mechanism of absorption of SO2 (a primary constituent of coal combustion effluents) by sodium humates is detailed. Absorption occurs mainly via simple neutralization, but SO2 is also complexed by HA under acidic conditions. Optimum SO2 sorption by HA-FA mixtures of various ratios is investigated. FA chemical makeup and properties are elucidated through selective dissolution in mineral acids. This behavior of FA in acids indicates that it contains several fractions of differing solubilities: an alkaline fraction, an Fe203-A1203 fraction, a magnetic Fe304 fraction and an Si02 fraction. FA is largely made up of spherical glass particles of varying sizes with mior amounts of crystalline matter. The chelating agents salicylic acid and HA dissolve FA at high pH. Conclusions are: an HA-FA system is feasible; HA is effective in dissolving FA; and HA-FA solutions absorb S02 well. Further research into HA-FA absorption of NOx species, the kinetics of FA dissolution in HA, the effect of HA and FA concentration on FA dissolution, the potential of HA-FA mixtures in other applications, the treatment and/or regeneration of HA in spent scrubbing solutions, and the treatment of sulfur buildup in scrubbing solutions is recommended. (Seip-IPA)
W78-06347

CHARACTERIZATION OF THE NON-VOLATILE ORGANIC MATERIAL DURING PHYSICAL-CHEMICAL TREATMENT OF THE DISTRICT OF COLUMBIA RAW WASTE-WATER,
Washington Technical Inst., Washington, DC. Water Resources Research Center.
M. H. Aldridge, T. A. Pressley, C. Chapin, and A. Welebir.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 267, Price codes: A03 in paper copy, A01 in microfiche. WRRC Report No. 9, Final Report, August, 1976. 28 p, 2 fig, 9 tab, 8 ref. OWRT B-007-DC(1), 14-34-0001-6066.

Descriptors: *Waste water treatment, *District of Columbia, *Chlorination, *Adsorption, *Filtration, *Organic wastes, *Nitrogen compounds, Analytical techniques, Volatility, Ethers, Organic compounds, *Physico-chemical waste water treatment, *Breakpoint chlorination, *Carbon adsorption, *Dual-media filtration, Non-volatile organic wastes, Nitrogenous wastes, Amphoteric wastes.

A physical-chemical treatment process used in a D.C. pilot waste-water treatment plant was examined; it consists of low-lime clarification system which feeds effluent into two parallel systems: (1) breakpoint chlorination, carbon adsorption, and dual-media filtration, and (2) neutralization, carbon adsorption, and dual-media filtration. The systems were operated and tested for a 1-month period in September 1974. Systems, sampling and sample preparation procedures, separation scheme, analytical techniques, and reagents are described. The major portion of the organic materials in treated and untreated waste water exists as nonvolatile materials, of which 90% were classified as ether-insoluble, amphoteric materials. Organic bases represent the least amount of ether-soluble organic material; 95% or more of the ether-soluble materials existed as acidic and neutral materials. Following breakpoint chlorination and carbon adsorption, an increase in strong acids was observed; this may have been accompanied by a comparable increase in the volatile chloroform. Fifty % or more of the nitrogenous organic material in both untreated and treated waste water may be classified as volatile. The nonvolatile nitrogenous organic material existed as ether-insoluble, amphoteric materials. Proteins and amino acids, carbohydrates and hydroxylated aromatic compounds represented about 30% of the organic materials in the treated and untreated waters. Further study recommendations are included. (Seip-IPA)
W78-06353

OPTIMAL ARTIFICIAL AERATION DESIGN IN POLLUTED STREAMS RECEIVING THERMAL DISCHARGE,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 5G.
W78-06357

EFFICIENT AND EQUITABLE PRICING FOR WASTEWATER SYSTEMS: THE MADISON METROPOLITAN SEWERAGE DISTRICT,
Wisconsin Univ.- Madison. Dept. of Agricultural Economics.
D. H. Peterson, and D. W. Bromley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 170, Price codes: A08 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, WIS WRC 77-09, 1977. 157 p, 10 figs, 44 tables, 116 refs. OWRT B-087-WIS(3), 14-31-0001-4139.

Descriptors: *Cost sharing, *Sewage treatment, Waste water treatment, Management, *Pricing policy, Cost-benefit analysis, Wisconsin, Utility rates, Water rates, Sewerage, Pricing models, *Madison Metropolitan Sewerage District(Wis), Decision making.

Pricing policies for local public wastewater systems were investigated. The objectives of a pricing policy are the attainment of efficiency and equity. The existing pricing rules for both water and sewerage services are the result of traditional utility rate practices. The primary emphasis on rate design has been to structure rates which will recover all the costs of service. The concepts of economic efficiency and social equity have not been well defined; consequently, the ideas of efficiency and equity have become intertwined and confused. Cost allocation methods usually result in average cost pricing. Efficiency criteria require a method of marginal cost pricing. A price-making decision method is needed for wastewater management which will reveal the tradeoffs between the attainment of efficiency and equity, and will incorporate explicit value judgments as a part of the decision-making process. The pricing model developed in this study shows how wastewater managers can choose a pricing rule for sewerage services which can be considered to be both efficient and equitable. In most cases, a rule of average cost pricing may achieve both of these objectives, provided that a distinction is made among users as to the differences in spatially related costs.
W78-06358

CHLORIDES IN THE KRAFT RECOVERY SYSTEM,
Institutet for Vatten- Och Luftvardsforskning, Stockholm (Sweden).
H. Norrstrom.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 598, Price codes: A04 in paper copy, A01 in microfiche. Typescript, 26 p, 17 fig, November 1977.

Descriptors: *Chlorides, *Kraft pulping, *Pulp and paper industry, *Water pollution control, *Bleaching wastes, Effluents, Water pollution sources, Industrial wastes, Waste disposal, Corrosion control, Costs, Biochemical oxygen demand, Color, Recovery systems, Economics, Alternative costs.

Methods of reducing bleaching effluents in kraft paper pulp processing were investigated, especially the effects of elevated chloride levels on kraft mill processes and equipment, chloride bleedout systems, and chloride balances. Oxygen bleaching and prolonged cooking result in lower discharges at lower cost, while separate evaporation and ion exchange techniques result in increased cost. Marked reduction in bleach effluent can be achieved without recycle to the recovery. Bleaching effluents represent a large proportion of total discharges in the industry, and in a modern mill for conventionally-bleached softwood kraft pulp, over half of the seven-day BOD and almost 90% of the color originates in the bleaching process. Bleaching effluents may contain compounds that degrade slowly and could accumulate in living organisms. There are two principal ways of reducing bleaching effluents: (1) modified process technology, such as prolonged delignification in the cook; or (2) oxygen bleaching followed by final bleaching with minimal chlorination from the bleaching chemicals. Concentrating the organic part of the effluent can be achieved by system closure, membrane techniques, resin sorption, and the like. The concentrated stream can then be sent to a destruction system with no link to the mill system or to the recovery system. The drawback is the input of chlorine compounds to the recovery system and the build-up of chlorine. (Lynch-Wisconsin)
W78-06374

DECOMPOSITION OF SEWAGE SLUDGE COMPOST IN SOIL: II. PHOSPHORUS AND SULFUR TRANSFORMATIONS,
Agricultural Research Service, Beltsville, MD. Biological Waste Management Lab.; and Agricultural Research Service, Beltsville, MD. Soil Nitrogen Lab.
J. M. Taylor, L. J. Sikora, C. F. Tester, and J. Parr.
Journal of Environmental Quality, Vol. 7, No. 1, p 119-123, 1978. 2 fig, 2 tab, 32 ref.

Descriptors: *Clay loam, *Silts, *Sands, *Sludge, *Phosphorus, Sulfur, Loams, Sludge treatment, Sludge disposal, Incubation, Waste water treatment.

Varying amounts of sewage sludge compost were incubated for 54 days at 22C in Evesboro loamy sand, Christiana silty clay loam, and Fauquier silt loam to evaluate the production of extractable phosphorus and sulfur. The sludge compost was incubated with carbon dioxide and ammonia and in applications of 0, 2, 4, and 6% of the dry weight. The amounts of extractable phosphorus and sulfur were dependent upon immobilization by iron and aluminum and mineralization by microbial activity. The Fauquier soil-sludge medium yield the least amount of extractable phosphorus and sulfur, with initial immobilization followed by mineralization at 54 days. Phosphorus mineralization occurred initially in the Evesboro soil-sludge mixture, the medium with the highest extractable phosphorus, with immobilization at 54 days. Extractable sulfur increased in this mixture after 54 days. An initial increase in extractable phosphorus was observed in the Christiana soil-sludge mix, followed by a decrease of phosphorus during incubation. Extractable sulfur was immobilized in this mixture during the early incubation period; higher compost applications of 4 and 6% produced subsequent sulfur mineralization. Applications of sludge compost adequately supplied or altered phosphorus and sulfur concentrations for plant growth. (See also W78-04581) (Lisk-FIRL)
W78-06414

MATHEMATICAL MODELING AND ECONOMIC OPTIMIZATION OF WASTE-WATER TREATMENT PLANTS,
Louvain Univ. (Belgium). Dept. of Engineering.
D. Tyteca, Y. Smeers, and E. J. Nyns.
Critical Reviews in Environmental Control, Vol. 8, No. 1, p 1-89, 1977. 10 fig, 11 tab, 231 ref.

Descriptors: *Mathematical models, Analytical techniques, *Treatment facilities, *Bibliographies, *Activated sludge, *Waste water treatment, Aeration, Biological treatment, *Reviews, Anaerobic treatment, Sludge digestion, Cost-benefit analysis, *Optimization, Dynamic programming, Waste water treatment, Mathematical studies, Municipal wastes.

Mathematical modeling procedures in waste water treatment plant processes were evaluated in an effort to achieve economic optimization of treatment facilities. A framework of treatment plant methods was developed for unit processes employing primary settlers, activated sludge aeration, secondary settlers, sludge thickening, sludge digestion, and press filtration. A review of mathematical models describing the kinetics of bacterial growth and substrate elimination was presented for single and multicomponent substrates, and microbial decay and growth stages. Model applications to biological treatment of waste water were evaluated with respect to kinetic parameters, including: oxygen demand, oxygen transfer efficiency, temperature effects, sedimentation, clarification, flocculation, and filtration. Mathematical models were developed for each of the treatment processes in the framework with respect to the interrelationships of the kinetics parameters. A study of dynamic models, trickling filters, thickening processes, anaerobic digestion kinetics, press filtration, and energy requirements of aeration devices was also conducted. Models of global treatment processes encompassing total plant operations and costs associated with each process unit were considered. The development of economic optimization models based on global models was attempted to maximize efficiency and minimize costs. The optimization study was directed toward activated sludge and anaerobic digestion processes, whole treatment plant cost minimization, and network optimization. (Lisk-FIRL)
W78-06415

SLUDGE COMPOSTING: A DISCUSSION OF ENGINEERING PRINCIPLES, PART I,
Los Angeles-Orange County Metropolitan Area Project. Regional Wastewater Solids Management Program.
R. T. Haug, and L. A. Haug.
Compost Science, Vol. 18, No. 6, p 6-11, November-December, 1977. 7 fig, 1 tab.

Descriptors: *Sludge treatment, *Biodegradation, *Volatility, *Aeration, *Sludge digestion, Degradation(Decomposition), Dewatering, Analytical techniques, Mathematical models, Sludge disposal, Waste water treatment, Municipal wastes.

Mathematical models were developed to represent the thermodynamic behavior of sludge composted by several techniques with and without amendments. The methods included: the windrow system, in which piles of waste are periodically rotated; the aerated pile system in which waste piles are maintained under aerobic conditions without turning; and the mechanical method, in which sludge is constantly rotated and aerated. A sludge composting mass balance equation, applicable to the aerated pile, the windrow, and the mechanical composting methods, was presented for calculating the quality of the compost material, recycle ratios for both dry and wet weights, the compost recycle solids, and the final desired solids contents. Techniques were developed for controlling volatile solids production during composting, based on the relationship to moisture content and mass balance. Volatility of the compost was found to decrease as the amount of cake solids decreased and recycled compost increased. Measures suggested for maintaining or increasing mixture volatility were: to increase the dewatered cake solids by drying the sludge before composting; to compost raw sludge rather than digested sludge solids; or to add a dry, degradable organic amendment. The volatilities examined exhibited a linear relationship to the total weight of the amendment required. (Lisk-FIRL)
W78-06416

SIMULATION STUDIES ON OPTIMIZATION OF THE ACTIVATED SLUDGE PROCESS,
Toledo Univ., OH. Dept. pf Civil Engineering.
D. I. Angelbeck, and A. B. Shah-Alam.
Journal Water Pollution Control Federation, Vol. 50, p 31-39, January, 1978. 4 fig, 1 tab, 30 ref.

Descriptors: *Activated sludge, *Mathematical models, *Aeration, *Microorganisms, *Analytical techniques, Optimization, Nutrients, Dynamic programming, Waste water treatment.

Optimization of the activated sludge treatment process of waste water was investigated in simulation studies with dynamic modelling. Two system differential equations were derived for the analysis of sludge and substrate mass balance. Microorganism mass balance in a completely mixed aerator was calculated as a function of influent sludge concentration and flow rate, microbial growth rate and endogenous decay rate coefficients, and dilution rates. Sinusoidal curves for system dynamics were used to evaluate the variations of influent microbial concentrations and substrate levels. System control was maintained by aerator detention time and sludge wastage rate. Optimal operational control of the system with a variational calculus technique minimized the desturbances in the effluent quality. Aerator detention time and sludge wastage rate were found to control the magnitude of the effect of system perturbations on the effluent quality. (Lisk-FIRL)
W78-06417

MEASURING AND PREDICTING FLOTATION PERFORMANCE,
Toronto Univ., (Ontario). Dept. of Civil Engineering.
R. Gehr. and J. G. Henry.
Journal Water Pollution Control Federation, Vol. 50, No. 2, p 203-215, February, 1978. 11 fig, 3 tab, 14 ref.

Descriptors: *Flotation, *Dissolved oxygen, *Forecasting, *Laboratory tests, *Continuous flow, Model studies, Saturation, Analytical techniques, Treatment facilities, Separation techniques, Waste water treatment, Municipal wastes.

Techniques for the measuring and predicting dissolved oxygen flotation performance in waste water treatment were developed in laboratory batch tests and full-scale continuous flow flotation experiments. The dissolved air flotation process, involving air introduction, pressurization, polymer addition, blending, and flotation, was evaluated with respect to a series of parameters measured in the effluent samples. An air saturation level of 90% was recorded after batch flotation; a saturation of 41-52% was measured in the continuous flow full scale operation. The correlation between float solids concentration and the air-solids concentration was not significant. A thickening parameter was used in the batch tests to assess sludge amenability to flotation and to evaluate the effect of polymer dosage on flotation. When the thickening parameter was held constant during continuous flotation, changes in float solids concentration, recycle volume, influent volume, and available air mass could be predicted. Saturation levels in both batch and continuous flotation processes were 90% when the pressurizer in the continuous flow flotation operation was not allowed to clog. Flotation performance was directly dependent upon polymer dosage. Continuous flow flotation systems provided greater thickening and a clearer subnatant than the batch units. (Lisk-FIRL)
W78-06418

FACTORS INFLUENCING OXYGEN INPUT IN AERATORS WITH VERTICAL SHAFT (AZ OXIGENBEVITELT BEFOLYOASOLO TENYEZOK A FUEGGOLEGES-TENGELYU FELUELETI LEVEGOZTETOKNEL),
For primary bibliographic entry see Field 8C.
W78-06419

HYDRAULIC INVESTIGATION OF THE OPERATION OF DIFFERENT DESIGNS OF SECONDARY SETTLERS (IDRAVLICHESKOE ISSLEDOVANIE RABOT'L VTORICHNJIKH OTSTOINIKOV RAZLICH'IKH KONSTRUKCII),
For primary bibliographic entry see Field 8C.
W78-06420

MEASUREMENT OF TRICKLING FILTER EFFECT ON POLLUTED RIVERS (MESSUNG DES BENTHALEFFEKTS IM VORFLUTER),
Technische Hochschule, Darmstadt (West Germany). Inst. fuer Wasserversorgung, Abwasserbeseitigung und Raumplanung.
For primary bibliographic entry see Field 5B.
W78-06421

1978 SEWERAGE PROJECT FORECAST.
For primary bibliographic entry see Field 5G.
W78-06423

THE BARCELONA CONVENTION AND ITS PROTOCOLS,
Ministry of Foreign Affairs, Rome (Italy).
For primary bibliographic entry see Field 5G.
W78-06424

ENVIRONMENTAL POLLUTION CONTROL IN METROPOLITAN ATHENS,
Environmental Pollution Control Project, Athens (Greece).
For primary bibliographic entry see Field 5G.
W78-06425

COMPUTERIZATION AND AUTOMATION OF WASTEWATER SYSTEMS,
For primary bibliographic entry see Field 5G.
W78-06427

CALCULATION OF FLOW RESTRICTION LENGTHS FOR RAIN OVERFLOW AND BASINS (BERECHNUNG DER DROSSELSTRECKE VON REGENUEBERLAEUFEN UND REGENBECKEN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 8B.
W78-06428

CITY STORM SEWERS DUG IN CLOSE QUARTERS.
For primary bibliographic entry see Field 8C.
W78-06429

NEW SHALLOW SEWER BEATS HIGH COST OF DEEP GRAVITY SYSTEM,
For primary bibliographic entry see Field 8G.
W78-06430

SEWER STRATEGIES FOR THE DALES AND THE FENS.
Surveyor, Vol 151, No 4465, p 14, January, 1978.

Descriptors: *Sewerage, *Storm water, *Treatment facilities, *Floods, *Infiltration, Sewers, Storm runoff, Storm drains, Pumping plants, Waste water treatment, Municipal wastes.

Sewage system overloads in West Yorkshire and Spalding, England, have been eliminated through the construction of new sewage treatment facilities. Sewage overflows in the Denby Dale area of Yorkshire had caused flooding of a gummed paper manufacturing plant several times a year. The Clayton West treatment works, with a design capacity of 1022 cu m/day and an actual flow of 2200 cu m/day, will be enlarged to a capacity of 5500 cu m/day. Sewers will be relaid to prevent infiltration and flooding. The overloaded treatment works at Spalding will be replaced by a new sewage treatment facility. Flooding was primarily caused by the unreliable storm water pumping system of the old works. The new treatment facility will provide partial sewage treatment before effluent is discharged into the River Welland. The new pumping system will include individual rising mains in each pumping station; all uncontrolled storm flows are now being handled by two storm drains. (Lisk-FIRL)
W78-06431

UPDATING AND COMPLETING SEWER RECORDS COULD COST LESS THAN YOU THINK.
For primary bibliographic entry see Field 8G.
W78-06432

MEASURING PRESSURE SURGES IN PIPELINES.
For primary bibliographic entry see Field 8G.
W78-06433

PIPELINE FLOATED ACROSS RIVER.
For primary bibliographic entry see Field 8F.
W78-06434

DIRTY 'OLE MAN RIVER' GETTING CLEANED UP.
For primary bibliographic entry see Field 8F.
W78-06435

NEW PORTOBELLO OUTFALL.
Water and Waste Treatment, Vol 20, No 12, p 28-31, December, 1977. 3 fig.

Descriptors: *Outlets, *Outfall sewers, *Pumping stations, *Conveyance structures, *Sewerage, Diffusion, Penstocks, Tunnel construction, Pipes, Protective coatings, Waste water treatment, Municipal wastes.

A new outfall constructed at the Portobello cliffs in England has a dry weather flow capacity of 6,800 liters/sec, a discharge rate 10 times that of the 1928 outfall it replaces. The outfall tunnel has a diameter of 3.4 m and a length of 1,830 m and will discharge treated effluent through a diffuser at a low tide ocean depth of 14.4 m. The shaft from the pumping station to the outfall tunnel was laid in water-bearing chalk which required manual excavation and peripheral ring grouting around the outside of the shaft for support. A nine shaft diffuser system with four port diffuser heads mounted on each shaft was installed on the last 347 m of the outfall. Waste water is treated at the pumping station which combines mesh cup screens, grit dredging, and solids dewatering and pressing. Preparation of the pumping station site in the chalk cliff was required before construction of the foundation. The final cost of the project was estimated at 3.7 million pounds sterling. (Lisk-FIRL)
W78-06436

PIPEFREEZING A SEWER.
For primary bibliographic entry see Field 8C.
W78-06437

A TOUGH CONTENDER FOR PIPEWORK. SIMPLE AS ABS,
For primary bibliographic entry see Field 8G.
W78-06438

STANDBY POWER.
For primary bibliographic entry see Field 8C.
W78-06440

DEWATERING SLUDGE CONTAINING SOLID MATTER AND BOUND AND UNBOUND WATER.
Australian Patent 488,609. Issued December 8, 1977. The Australian Official Journal of Patents, Trademarks, and Designs, Vol 47, No 46, p 4168, December, 1977.

Descriptors: *Dewatering, *Sludge treatment, *Alkalis(Bases), *Hydrogen, *Patents, Carbon, Sodium compounds, Calcium hydroxide, Potassium compounds, Design data, Waste water treatment, Municipal wastes.

A process using an amine to dewater sludge consisting of solid materials and water has been patented. The technique involves mixing an amine containing an alkyl or hydrogen, an alkyl radical with one to six or two to six carbon atoms, and a total number of carbon atoms from three to seven, with the sewage sludge. The temperature is maintained below the inverse critical solution temperature of the amine. The reduced temperature causes the formation of a solid and a liquid which contains the amine and the water. After separation of the liquid and solid phases, the temperature of liquid phase is raised to above the critical solution temperature, thereby separating into an amine and a liquid. The amine is removed from the water and mixed with an alkaline solution containing lithium hydroxide, sodium, or potassium salt of a weak acid solution. The addition of a hydroxide solution reduces the residual amine in the solid. (Lisk-FIRL)
W78-06441

WASTE TREATMENT PLANT.
Australian Patent 488,148. Issued November 17, 1977. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol 47, No 43, p 3920, November, 1977.

Descriptors: *Aeration, *Settling basins, *Patents, *Scum, *Aerobic treatment, Water purification, Reaeration, Waste water treatment, Design data, Equipment, Municipal wastes.

A waste water treatment tank that utilizes an aeration process and a settling basin has been patented. The tank is divided into two parts by an interior, centrally-located baffle. One side of the tank contains an aeration unit which aerates the waste water and maintains a continuous state of turbulence. The waste water passes into the aeration chamber of the tank through an inlet. After aeration, it is transferred by the interior baffle into the adjacent settling chamber containing an outlet. The waste water undergoes settling in this chamber; scum is recovered from the waste and recirculated to the aeration chamber via a recirculation device. (Lisk-FIRL)
W78-06442

WASTEWATER TREATMENT.
Australian Patent 488,263. Issued November 24, 1977. The Australian Official Journal of Patents, Trade marks, and Designs, Vol 47, No 44, p 3990, November, 1977.

Descriptors: *Biochemical oxygen demand, *Nitrates, *Biodegradation, *Patents, *Aeration, Denitrification, Design data, Aerobic bacteria, Aerobic treatment, Waste water treatment, Municipal wastes.

A raw waste water treatment process which reduces BOD levels through partial recycling of the denitrified effluent has been patented. The BOD content of the sewage effluent is reduced by aeration in an aeration chamber. Nitrogen compounds are oxidized to nitrates by biodegradation with aerobic microorganisms. The nitrates are conveyed to a denitrification zone where the nitrate-bearing waste water is denitrified. A part of the waste water containing nitrates which has been partially treated is returned and mixed with the raw influent in a facultative zone. This recycling of a portion of the waste water effects a BOD reduction in the raw effluent and a nitrate reduction in the recycled waste water. (Lisk-FIRL)
W78-06443

PROCESS AND APPARATUS FOR THE BIOLOGICAL PURIFICATION OF EFFLUENT.
Australian Patent 488,242. Issued November 24, 1977. The Australian Official Journal of Patents, Trademarks, and Designs, Vol 47, No 44, p 3985, November, 1977.

Descriptors: *Activated sludge, *Aeration, *Settling basins, *Patents, *Design data, Equipment, Oxygen, *Biological treatment, Waste water treatment, Municipal wastes.

A biological treatment system using two interchangeable basins to aerate and settle waste water has been patented. The two connected basins have air-tight sealed inlets. Sewage effluent is introduced into the first basin, where it is injected with pure oxygen or oxygen-enriched air. Activated sludge is administered and the mixture is retained in the basin for a predetermined period. The aerated effluent is then passed into the second basin, where sedimentation of solids occurs. Clarified water is removed from the tank until the activated sludge level in the first basin decreases to a predetermined level. At this point, the process is reversed and the second basin is transformed into an aeration tank while the first basin operates as a sedimentation basin. (Lisk-FIRL)
W78-06444

RESIDUES DEWATERING DURING WATER AND SEWAGE TREATMENT--BY FREEZING WITH COOLING AGENT LAYERWISE AND MELTING TO DEPOSIT RESIDUES.
Soviet Patent SU-546-566. Issued March 3, 1977. Derwent Soviet Inventions Illustrated, Vol. A, No. 1, p 1, February, 1978.

Descriptors: *Dewatering, *Freezing, *Specific gravity, *Patents, *Melting, Separation techniques, Sludge, Solid wastes, Filtration, Design data, Waste water treatment, Municipal wastes.

A patent has been issued for a dewatering process in which residues from waste water treatment plants are frozen in a column with a cooling agent, such as n-butane; liquids are melted and decanted in the same column. The residues are introduced into the top of a column in which the cooling agent flows upwards. The n-butane has a density of 0.5-0.85 g/cu cm and a specific gravity of 0.605 g/cu cm at -5C. Depending upon column height, the temperature varies from -10 to 4C over 0.1-3 min in the cooling zone and from 0-4C over 0.1-6 min in the melting zone. For residues containing hydroxides, aluminum salts, organics and mineral materials, 250 liters of the cooling agent is added to the column for 14 liters of de-aerated liquid. The liquid effluent sinks to the bottom of the column where the temperature is 1.5C; vapor forms in the top layer where the temperature is -9C. Ice particles formed in the upper layer drop through the liquid levels, carrying residue particles to the bottom layer where they melt. Vacuum filtration removes the residue particles; the liquids are separated according to their specific gravities. The cooling agent is condensed and reused. Dewatering is increased by performing freezing, melting, and decanting in the same column. (Lisk-FIRL)
W78-06445

PACKAGED PLANT FOR PHYSICOCHEMICAL PURIFICATION OF WASTE WATER--WITH GRAVITY EVACUATION OF SLUDGE FROM FLOCCULATING AND DECANTING ZONES.
Belgian Patent BE-858-720. Issued January 2, 1978. Derwent Belgian Abstracts, Vol. A, No. 3, p 4 February, 1978.

Descriptors: *Flocculation, *Separation techniques, *Patents, *Gravity, *Sludge disposal, Coagulation, Neutralization, Construction materials, Plastics, Steel, Baffles, Waste water treatment, Municipal wastes.

A physicochemical waste water treatment plant that separates liquids and solids and discharges settled sludge by gravity flow has been patented. The packaged treatment plant is contained in a three compartment steel tank. An upper rectangular compartment coagulates and neutralizes the incoming waste water. The liquid is passed beneath partitions into a flocculation and separation chamber having walls inclined toward the third compartment. Baffles mounted on the inclined walls of both the second and third chambers reduce the velocity of the inflowing waste water. Solids separated in the flocculation compartment are evacuated by gravity flow to the third decantation and sludge disposal chamber. The plastic baffles mounted in the lower chambers are inclined at an angle of 55-60 degrees to the walls. The treatment plant has a flow capacity of 1-50 cu m/hr and provides economical installation and operation. (Lisk-FIRL)
W78-06446

SEWAGE SLUDGE TREATMENT BY STEAM--USING COMPRESSED AIR TO PREVENT BUBBLE ESCAPE.
French Patent FR-2343-703. Issued November 10, 1977. Derwent French Patent Abstracts, Vol. A, No. 1, p 3, February, 1978.

Descriptors: *Sludge treatment, *Steam, *Bubbles, *Heat treatment, *Patents, Heating, Aerobic treatment, Sludge disposal, Water purification, Separation techniques, Design data, Waste water treatment.

A patent has been issued for a heat treatment process for sewage sludge clarification. Steam and compressed air are introduced simultaneously into a sludge reactor. The escape of air bubbles from the reactor is prevented by the flow of compressed air distributed evenly over the surface of the sludge. After heat treatment, clarified water is separated from the sludge and decanted from the reactor for treatment in an activated sludge tank. Noxious gases produced during heat treatment of the sewage sludge are deodorized. The unit is self-contained and does not require high temperatures. (Lisk-FIRL)
W78-06447

WHITHER AUTOMATIC CONTROL IN THE SEWAGE TREATMENT FIELD,
Kent Instruments Ltd., Luton (England).
L. Thurley.
Water Services, Vol. 81, No. 981, p 693-696, November, 1977. 2 fig.

Descriptors: *Automatic control, *Analog models, *Digital computers, *Analog computers, *Activated sludge, Settling basins, Storm water, Screens, Sludge disposal, Treatment facilities, Waste water treatment, Municipal wastes.

The expansion and automation of waste water treatment facilities with analog discrete units or digital processes to meet effluent standards are discussed. Analog units include a flow control loop that operates a statutory recorder with a penstock to restrict the flow of storm runoff. A monitor for the coarse and fine screens can activate a rake mechanism or additional screening. Isolation penstocks with relay circuitry control the velocity in the grit separator with additional flumes, detritors, or macerators. Analog principles or inflow channel flumes are used to equalize the flow of waste into the primary sedimentation tanks. An ultrasonic sludge level detector regulates the hydrostatic removal of sludge on a time or suspended solids basis. The activated sludge controls involve a magnetic flow controller and detector head or a flow summation monitor of individual activated sludge channels. Mackereth probes are used for dissolved oxygen level monitoring. Preset digital processors automatically control the storm water inflow, primary sedimentation, and final sedimentation. Screens and detritors are automatically activated in sequential order according to flow rate. The handling, treatment, and disposal of sludge is more efficiently handled with the aid of visual and printed data from the digital processors. (Lisk-FIRL)
W78-06448

HORSHAM'S NEW STW HANDLES INCREASING POPULATION.
Water Services, Vol. 81, No. 981, p 705-706, 708-709, November, 1977. 1 fig.

Descriptors: *Sewerage, *Treatment facilities, *Biological treatment, *Dewatering, *Outlets, Humus, Intakes, Pumping plants, Waste water treatment, Municipal wastes.

The new municipal waste water treatment plant in Horsham, Sussex, England, with a daily effluent load of 335,000 liters and a BOD load of 414 kg, was constructed to alleviate the 342% overload on the existing facilities. The inlet works and pumping station, with three screw pumps, have a capacity of 2,680 liters/sec; an additional pump with a 1,320 liter/sec capacity is planned. Two storm water tanks were constructed with space provisions for two additional storm water holding tanks. Sewage effluent is mechanically screened and then hydrostatically desludged in two sedimentation tanks. Four biological filters are operated with alternate double filtration. Effluent is further treated by two interchangeable primary and two secondary humus tanks which return effluent to the secondary biological filters. Two sludge holding tanks dewater sludge that is conditioned with a polyelectrolyte and pressed by horizontal filter belts. Flowmeters monitor effluent and activate diesel generators for alternate power sources in the event of a power failure. Treated effluent is discharged into the River Arun through three outfalls. (Lisk-FIRL)
W78-06449

TREATMENT PLANT AND PIPELINE FLOW CONTROLLED BY MINICOMPUTER SYSTEM.
Water Services, Vol. 81, No. 981, p 700-701, November, 1977. 2 fig.

Descriptors: Computers, *Treatment facilities, *Biological treatment, *Data transmissions, *Control systems, Flow control, Pipelines, Sewerage, Transportation, Aeration, Screens, Sludge disposal, Outlets, Waste water treatment, Municipal wastes.

The largest municipal waste treatment facility in the Netherlands, located in Eindhoven, is controlled by a Philips P800-series minicomputer with telemetry links. The Eindhoven facility, with a population capacity of 750,000, also receives sewage from several southern villages via a 46 km long pipeline. The treatment processes, including bar screening, grit removal, primary and secondary sedimentation, aeration, and sludge pumping, are monitored and controlled by a computer system which furnishes visual and printed information on levels, flows, motor currents, and operating times. Six pumps, controlled by the computer's monitoring of the waste levels in the supply channels, have been installed to optimize pumping operations between the bar screens and the grit chamber. Dissolved oxygen levels in the three aeration basins are maintained by 24 loops controlled by the computer. Excess sludge pumping and routing to another treatment facility, as well as measurement of effluent quality parameters at the discharge point, are controlled by the computer. A Philips RL 200 time division multiplex telemetry system relays pipeline information to the central control room at the treatment facility. Based upon the pipeline data, the computer provides optimal use of the buffer in the pipeline and prevents or reroutes overflows. (Lisk-FIRL)
W78-06450

AGENCY SOUGHT FOR CANADIAN DOMESTIC UNIT.
Water and Waste Treatment, Vol. 21, No. 1, p 17, January, 1978.

Descriptors: *Aeration, *Settling basins, *Activated sludge, *Patents, *Domestic wastes, Microbial degradation, Water purification, Sands, Filters, Carbon dioxide, Waste water treatment, Waste water disposal, Sludge disposal, Municipal wastes.

A domestic sewage treatment unit that produces purified water and non-odorous sludge has been developed for distribution in England by Waltec Industries Limited of Penctanguishene, Ontario, Canada. The 'Aquarobic' unit, intended as a replacement for domestic septic tanks, consists of a 600-gal fiberglass aeration tank and a 90-gal settling basin. The system utilizes aeration and microbial degradation to purify waste water. Excess air is introduced into the raw waste by an elelctro-mechanical pump. Aerobic microorganisms consume the carbon-bearing pollutants in the sewage, producing carbon dioxide and inert chemical ash. The waste water is passed through a sand filter before discharge into the surrounding land. The sludge can be contained in the tank for a period of up to eight years before removal is required. The unit has a capacity of up to eight years before removal is required. The unit has a capacity of 400 gal/day and requires 0.39 kilowatts/hour electrical power for operation of the air supply pump. (Lisk-FIRL)
W78-06451

SAFETY INTERLOCKING AT SEWAGE WORKS.
Water and Waste Treatment, Vol. 21, No. 1, p 22, January, 1978.

Descriptors: *Treatment facilities, *Biological treatment, *Filters, *Safety factors, *Locks, Safety, Equipment, Design data, Structural design, Waste water treatment, Municipal wastes.

Castell Locks, a European safety interlocking manufacturer, has developed a safety lock system for waste water treatment plants. Full-scale testing of the system was conducted at a treatment plant in Wolverhampton, England. Six biological filter beds were equipped with power isolators and interlocks which prevent access to the beds when the electric current is connected. A Castell switch isolates the power supply to the beds, releasing a key when the switch is activated. The key releases the interlocks on the access doors and cannot be removed while the door is open. This safety precaution prevents the connection of the filter beds requires its own key, preventing access to one filter bed with the key from another. The system has been shown to be a cost-effective method of providing protection for plant personnel. (Lisk-FIRL)
W78-06452

NEW METHOD INJECTS SLUDGE INTO SOIL.
Water and Waste Treatment, Vol. 21, No. 1, p 17, January, 1978.

Descriptors: *Sludge digestion, *Sewage sludge, *Application methods, *Fertilizers, Equipment, Nitrogen, Soil treatment, Fertilizers, Farm wastes, Experimental farms, Waste water treatment, Waste water disposal, Municipal wastes.

A technique has been developed for injecting sewage sludge and agricultural slurries several inches below the soil surface. The method, which was developed to eliminate the visual and odor pollution resulting from land application of sewage effluent, utilizes a slave tanker equipped with sludge injection tubes. Two coulter discs and tines, mounted on the tanker, open a furrow into which sludge is injected through tubes attached to the backs of the tines. Two pairs of spring plates replace the gound over the sludge. This technique allows for the application of sludge on steeper gradients and reduces nitrogen loss from the sludge in the soil. On-site testing of the apparatus was conducted at the Anglian Water Authority's Great Billing works in England where 71% of the fertilizer used for agriculture is of sewage sludge origin. The process has been effective in the application of about 150 cu meters of digested sludge/sq acre of land at a rate of 1.8 cu m/min. (Lisk-FIRL)
W78-06453

DUTCH TREAT SEWAGE BY COMPUTER SYSTEM.
Processing, Vol. 24, No. 1, p 21, January, 1978. 2 fig.

Descriptors: Computers, *Treatment facilities, *Biological treatment, *Data transmissions, *Control systems, Flow control, Pipelines, Sewerage, Transportation, Aeration, Screens, Sludge disposal, Outlets, Waste water treatment, Municipal wastes.

A Philips P800-series minicomputer controls and monitors pipeline flows, water quality, and secondary treatment of sewage effluent at a municipal facility in Eindhoven, the Netherlands. The Eindhoven treatment facility, the largest waste water

treatment plant in the Netherlands, receives effluent from six pumping stations conveying wastes along a 46 km pipeline. The computer controls the plant's treatment processes, including coarse screening, grit removal, primary sedimentation, aeration, secondary sedimentation, and sludge pumping. The computer has been able to optimize the pump operation between the coarse screening and the grit removal chamber by automatically activating the pumps in sequential order to maintain a desirable level of waste in the channel. Pipeline flow data are fed into the computer via a time-division multiplex telemetry system. The computer is able to provide optimum buffer capacity in the pipes and prevent or reroute overflows. Monitoring equipment records the pH, redox potential, dissolved oxygen, temperature, conductivity and other parameters of effluent discharged into the Dommel River. Similar monitoring is conducted in the river above the point of discharge. The minicomputer furnishes a printout listing of water levels, flow rates, motor currents, operating hours, and other data. (Lisk-FIRL)
W78-06454

U.S.A. TRY RADIATION AGAIN.
Water and Waste Treatment, Vol 20, No 11, p 14, 16, November, 1977.

Descriptors: *Disinfection, *Radiation, *Gamma rays, *Cesium, *Pilot plants, Dewatering, Centrifugation, Sludge digestion, Sludge disposal, Fertilizers, Pathogenic bacteria, Waste water treatment, Municipal wastes.

Pilot plant investigations of the treatment of dried or composted sludge with ionizing gamma radiation to reduce pathogen levels are being conducted at the Sandia Laboratories in Albuquerque, New Mexico. The dried or composted sludge may be use for fertilizer or soil conditioner if pathogen levels are sufficiently reduced by irradiation. Small lots of the sludge are exposed to one megacurie of cesium-137, a waste product of nuclear reactors, activated by photons of 10 million electron volts. The sludge will be exposed to the gamma radiation in doses ranging from several thousand rads to several million rads. Doses of one million rads or less are expected to sufficiently reduce the pathogen levels in the sludge. Experiments will also be conducted on raw and digested sludge which has been dewatered by air drying, centrifugation, or filter pressing. The cost of the irradiation procedure is estimated at $60-70 per dry ton of sludge. (Lisk-FIRL)
W78-06455

FINE FILTRATION OF WASTE WATER USING ROTO-KLAER (FEINSIEBUNG VON ABWAESSERN DURCH DEN ROTO-KLAER),
Ingenieurberatung G. Morszeck, Hameln (West Germany).
V. W. Schoettler, and R. Schinke.
Fette-Seifen-Anstrichmittel, Vol 79, No 12, p 492-494, December, 1977. 1 fig.

Descriptors: *Filtration, *Separation techniques, *Filters, *Trickling filters, *Sands, Particle size, Seive analysis, Seives, Sewage treatment, Waste water treatment, Municipal wastes.

Applications of the ROTO-KLAER filter, manufactured by the Noggerath Co, for clarification of sewage at municipal treatment plants are presented. The ROTO-KLAER is capable of filtering fine material from sewage with a drum sieve unit. The filtration unit replaces the conventional sand traps a preclarification basins. The need for strainer racks is also eliminated by the ROTO-KLAER filter. The elimination of sand traps, preclarification basins, and strainer racks compensates for the higher cost of the ROTO-KLAER drum sieve. The overloading of trickling filter plants can be avoided and processes improved with the installation of the drum sieve filter. Installation information and additional application of the filter are also presented. (Lisk-FIRL)
W78-06456

OXYGEN INJECTION AT WORK'S INLET.
Water and Waste Treatment, Vol 21, No 1, p 16, January, 1978.

Descriptors: *Oxygenation, *Oxygen, *Odor, *Pilot plants, *Aerobic treatment, Waste water treatment, Sewage treatment, Treatment facilities, Sewage effluent, Municipal wastes.

An oxygen injection system, developed by BOC Ltd of England, has eliminated the odor problem at the Holdenhurst Sewage Treatment Works in England. Odors emanating from the treatment facility during holiday seasons were controlled by the pilot installation of the Vitrox system at the inlet to the waste treatment plant. About three-quarters of a ton of oxygen is injected daily into sewage waste as it arrives at the plant. The Vitrox system was found to afford an additional advantage to that of odor elimination. The additional oxygen enhances the biological treatment and quality of the sewage effluent, which receives a total oxygen load of more than 2 tons/day. Plans are being completed for the permanent installation of an oxygen injection plant at the Holdenhurst treatment facility. (Lisk-FIRL)
W78-06457

EXPERIMENT TO PRODUCE COMMERCIAL SOIL CONDITIONER FROM SEWAGE SLUDGE PROVES SUCCESSFUL.
For primary bibliographic entry see Field 5E.
W78-06458

HYGIENIZATION OF SEWAGE SLUDGE BY ELECTRON IN RADIATION,
Brown Boveri and Co., Ltd., Baden (Switzerland).
K. Tofaute.
Processing, Vol 24, No 1, p 22-23, January, 1978. 1 fig, 1 tab.

Descriptors: *Irradiation, *Electromagnetic waves, *Sludge treatment, *Screens, *Fertilizers, Disinfection sludge, Pathogenic bacteria, Salmonella, Viruses, Dewatering, Waste water treatment.

An electron irradiation process for the removal of pathogens from raw and digested sewage sludge has been developed by Brown Boveri and Company Ltd of Baden, Switzerland. The first stage of the irradiation process requires the screening of the sludge for the removal of foreign particles and homogenization of the remaining particles to about 1 mm. The pretreated sludge is applied in a thin layer to a rotating drum containing the irradiation apparatus. Irradiation is accomplished with a high-voltage rectifier attached to an electron through which the electrons are passed and deflected. The electron accelerator and scanner are operated in a vacuum. The irradiated, hygienized sludge is stored in a monitored, ventilated tank. Mortality rates of strains of Cole and Salmonella ranged from 10,000-100,000,000 with 300 krad irradiation; virus viability was reduced by 60-90%. The irradiated sludge was more easily settled and dewatered; coagulant requirements were reduced by as much as 50%. The irradiated sludge was more effective as fertilizer than steam-pasteurized sludge. A review of capital and operational costs is presented. (Lisk-FIRL)
W78-06459

HONG KONG'S LARGEST SEWAGE WORKS.
Water and Waste Treatment, Vol. 21, No. 1, p 6-7, January, 1978.

Descriptors: *Treatment facilities, *Biological treatment, *Aeration, *Sludge digestion, *Settling basins, Tertiary treatment, Waste water treatment, Red tide, Nitrogen, Municipal wastes.

A municipal sewage treatment plant currently under construction for Sha Tin near Hong Kong will have a daily capacity of 102,000 cu m of raw sewage when completed in 1980. The treatment facility, which will employ two physical treatment stages and one biological stage, will contain primary sedimentation tanks, aeration tanks, final settling tanks, sludge digestion and storage tanks, as well as a laboratory, an administration building, and a power generation building. The treatment facility will remove 92% of the pollutants in the sewage effluent before discharge into a landlocked harbor; provisions have been made for a tertiary treatment facility to protect the quality of the receiving harbor if necessary. The plant will receive a maximum flow of 3.6 cu m/second; biological treatment for nitrogen removal from the effluent will reduce the possibility of red tides in the harbor. The Sha Tin treatment facility, when fully developed, will be capable of treating sewage effluent from a population of 500,000. (Lisk-FIRL)
W78-06460

OZONE SHAKES CHLORINE'S HOLD ON DISINFECTION,
R. Remirez.
Chemical Engineering, Vol. 85, No. 4, p 59-61, February, 1978. 1 fig, 1 tab.

Descriptors: *Chlorination, *Ozone, *Disinfection, *Treatment facilities, *Oxygen, Equipment, Environmental sanitation, Organic compounds, Toxins, Waste water treatment, Water purification, Municipal wastes.

The transition from chlorine disinfection to ozone disinfection of sewage effluent by a number of waste water treatment facilities is discussed. Although the more expensive ozonation process requires constant gas dosages to prevent incomplete disinfection and toxin formation, chlorination can produce chlorinated organics which may be harmful to aquatic life. The relative expense of ozonation is reduced when the cost of dechlorination is required to eliminate harmful substances produced in the chlorine disinfection process. Sixteen municipal treatment facilities in the United States that employ ozone disinfection of waste water are cited. Union Carbide's UNOX/ozone system, which requires that oxygen be fed through the ozone generator only once, is evaluated for use in large treatment facilities. The alternative use of air rather than oxygen as a feedstock for ozone disinfection is discussed for large and small capacity treatment facilities. (Lisk-FIRL)
W78-06461

SHIELDHALL SEWAGE PURIFICATION WORKS--SPECIFICATION FOR AND SELECTION OF MECHANICAL EQUIPMENT AND PUMPS,
Strain and Robertson (Consulting Engineers, Glasgow (Scotland).
J. S. Buyers, and J. MacDonald.
Chartered Municipal Engineer, Vol 104, No 12, p 218-223, December, 1977. 4 fig.

Descriptors: *Sewage treatment, *Screens, *Scum, *Treatment facilities, *Sludge disposal, Storm water, Equipment, Design data, Construction materials, Carbon filters, Waste water treatment, Municipal wastes.

Equipment and operational specifications for the design of a primary treatment facility in Shieldhall, Scotland, are reviewed. The plant will have an initial flow capacity of 48 mgd with provisions for expansion to a capacity of 60 mgd and for a secondary treatment facility. The two control centers for the treatment plant will be located in the presedimentation building and in the sludge pumphouse. A computer control system may be installed at a later date. Four identical low level screw pumps, each with a 980 liter/second capacity, pump influent to the presedimentation building which con-

tains an oil boom, inclined bar screens, and grit dredging machines. Six main screw pumps with a 1580 liter/second capacity convey the flow to 12 primary treatment tanks, each equipped with a magnetic flowmeter, a gate valve, and an automatic scraper with a scum blade. Storm water is bypassed by two penstocks to storm tanks equipped with manually-operated scrapers. Sludge from the primary treatment is discharged to an inspection chamber before transport by automatic sludge from the primary treatment is discharged to an inspection chamber before transport by automatic sludge from the primary treatment is discharged to an inspection chamber before transport by automatic sludge pumps to holding tanks. Air emissions will be filtered through carbon for odor control. Sample contract checklists, safety factors, and construction materials are described. (Lisk-FIRL)
W78-06462

BELT PRESS BEATS SLUDGE DEWATERING PROBLEMS.
Processing, Vol. 23, No. 12, p 24-25, December, 1977. 2 fig, 1 tab.

Descriptors: *Sludge, *Dewatering, *Filters, *Flocculation, *Polyelectrolytes, Sewage sludge, Hydraulic structures, Sludge digestion, Pressure, Sludge disposal, Waste water treatment.

A belt filter press, developed by Alfa-Laval Co Ltd, provides increased and prolonged pressure during the sludge dewatering process. The ecobelt system processes the sewage sludge through a drainage stage, a low-pressure section, and a high-pressure stage. The sludge is first flocculated with polyelectrolytes and passed through a drainage filter band for gravitational dewatering. The sludge is further dewatered as it is pressed by ploughs and rollers while passing horizontally through the drainage section. The resulting sludge cake, which has been dewatered by 50%, is passed between polyester filter bands mounted on perforated rollers with diminishing diameters within the low pressure zone of the process. Pressure on the sludge cake increases as the roller diameters decrease until the cake is passed into the high pressure stage controlled by two hydraulic cylinders. Pressure on the sludge cake is increased by flat belts that squeeze the sludge-bearing filter bands against a large perforated roller. The high pressure dewatering stage produces a final filter cake with a solids content 10% greater than sludge treated without the high pressure stage. Filter belts are subject to less wear because they are not over-extended; the filtrate and water removed during the process can be recycled. Suspended solids recovery with this process has ranged from 99% for raw and digested sludge to 9% for aluminum hydroxide sludge. Solids recovery averaged 95%. (Lisk-FIRL)
W78-06463

SEALING A SEWAGE LAGOON FOR HALF THE COST,
For primary bibliographic entry see Field 5G.
W78-06464

ENVIRONMENT GETS TOP TREATMENT IN HAWAIIAN SEWAGE OUTFALL JOB.
Western Construction, Vol. 53, No. 2, p 30, February, 1978.

Descriptors: *Outfall sewers, *Offshore platforms, *Excavation, *Coral, *Outlets, Hydraulic structures, Explosives, Cranes, Construction equipment, Waste water disposal, *Hawaii, Municipal wastes.

A mobile ocean platform and explosive charges were employed in the construction of a sewage effluent outfall for Honolulu, Hawaii. The construction firm of Healy-Tibbitts utilized .the Spider I offshore platform, which can transport equipment by walking along the ocean floor, to support excavation equipment. Shaped charges were required to break up the compacted coral on the sea floor in the outfall area. A 16-ft deep channel was blasted and 7,200 linear ft of material was excavated with a Lima 2400 crane and clamshell, a McKinnon-Tierney pile extractor, and a Cal-Weld hammer, all supported by the mobile platform. The outfall pipeline, ranging in diameter from 44 to 66 inches, contains a diffuser at the terminal of the outfall that discharges and disperses the sewage effluent at a depth of 100 ft. Divers were required to link the bell and spigot pipe sections and to set the explosive charges. The outfall will not be visible from the surface once the construction equipment is removed. (Lisk-FIRL)
W78-06465

CENTRALIZING SEWAGE TREATMENT IN DORSET.
Surveyor, Vol. 150, No. 4460, p 11-12, December, 1977.

Descriptors: *Treatment facilities, *Activated sludge, *Aeration, *Sewers, *Concrete pipes, Floods, Sumps, Conduits, Dissolved oxygen, Settling basins, Industrial wastes, Sludge treatment, Waste water treatment, Municipal wastes.

A waste water treatment facility, with a capacity greater than 3 million liters/day and serving an area of more than 11 km, has been completed in the Dorset area of England. Flooding problems encountered in the floodplain of the Stour River where the main trunk sewer was installed were alleviated with wellpoint dewatering and sump pumps. Twenty-one kilometers of sewers and rising mains were constructed of asbestos cement or spun iron ranging 150-600 mm in diameter. The treatment plant, with a capacity of 2,818,520 liters/day of domestic and 385,420 liters/day of industrial effluent, reduces suspended solids to 30 mg/liter and BOD to 20 mg/liter by biological treatment. Storm water flows that exceed three times the dry weather flow are directed by penstocks to eight storm water tanks, each with a 365 cu m capacity. After grit is removed activated sludge is introduced to the influent as it is passed to the aeration chamber. Complete aeration and mixing is accomplished by a Mammoth Rotor controlled by a dissolved oxygen meter. Effluent is treated in three settling basins before discharge into the Stour River. Activated sludge is hydrostatically removed and a portion is returned to the initial activated sludge operation. The remainder of the sludge is thickened in a 7.6-m tank with a picket-fence stirrer and removed to a holding tank for disposal. (Lisk-FIRL)
W78-06466

OVERALL OPTIMIZATION OF WATER PURIFICATION AND SLUDGE TREATMENT, (FY 1975-1977),
Japan Society of Civil Engineers, Tokyo. Sanitary Engineering Committee.
N. Tambo, A. Sato, H. Aya, S. Nambu, and S. Okamoto.
Environmental Research in Japan, 1976 Edition, 1977, p. 118-119.

Descriptors: *Sludge disposal, *Coagulation, *Filtration, *Dewatering, *Water purification, Pilot plants, Laboratory tests, Aluminum, Suspended solids, Waste water treatment, Municipal wastes.

Water purification and sludge treatment methods involving filtration and coagulation were evaluated in laboratory tests, pilot plants, and full scale treatment facilities. The ratio of aluminum to suspended solids significantly affected the removal capacities of both rapid filtration and direct filtration processes. The efficiencies of both filtration processes were similar and considered more effective than sedimentation for the removal of suspended solids. The optimum pH range for the effective coagulation of both organic and inorganic substances was established as pH 6.0-6.5. Coagulation with aluminum sulfate and polyacrylamide was efficient in solids removal and sludge generation but breakthrought occurred during initial direct filtration. Sludge quality was significantly affected by the ratio of aluminum coagulant to suspended solids. The volatile solids content of the sludge significantly affected the sludge dewaterability. Lime was the preferred sludge conditioner for landfill disposal. (Lisk-FIRL)
W78-06467

DEODORIZATION MEASURES FOR NIGHT SOIL TREATMENT PLANTS (SHINYO SHORI SHISETSU NO DASSHU TAISAKI NI TSUITE),
For primary bibliographic entry see Field 5G.
W78-06468

ENVIRONMENTAL MANAGEMENT IN A MEDITERRANEAN PORT CITY: HAIFA,
United Nations Environment Programs, Geneva (Switzerland). International Labor Office.
For primary bibliographic entry see Field 5G.
W78-06470

THICKENING OF WASTE ACTIVATED SLUDGE WITH A DISSOLVED AIR FLOTATION UNIT,
Geuetyn, Forsyth and Joubert, Inc., Pretoria, (South Africa).
O. Langenegger, and J. M. P. Viviers.
Water Pollution Control, Vol 77, No 1, p 79-86, 1978. 7 fig, 3 ref.

Descriptors: *Activated sludge, *Flotation, *Sludge disposal, *Pilot plants, *Aeration, Suspended solids, Physical properties, Volatility, Waste water treatment, Sludge treatment, Municipal wastes.

An air floatation system for concentrating waste activated sludge was designed in relation to the specific properties of activated sludge. Sludge volume index, suspended solids, volatile suspended solids, and sludge age were used as design criteria. Mixed sludge liquor reacted with a pressurized air-water solution was introduced to a clarification tank equipped with scrapers. Four samples of activated sludge from different treatment plants were treated in the air flotation pilot plant. A solids loading rate of 10 kg/sq m/hr required an air-solids ratio of 0.03; a downward flow rate of 6 m/hr in the clarifier reduced suspended solids by 98%. Water levels in the flotation tanks were adjusted to contact the varying float layer with the fixed level scraper. The scraper was operated at a speed of 1 m/min and a depth of 5 mm. Weirs were recommended for full scale plants so that water levels could maintain float layers above the water line and limit the total layer to 600 mm to facilitate drainage. Adequate turbulence in the reactor zone was reommended to promote adhesion of the sludge particles and the air bubbles. (Lisk-FIRL)
W78-06471

AUTOMATION OF WASTE WATER TREATMENT PLANTS--PART 1--DATA COLLECTION AND USE,
Anglian Water Authority, Norwich (England). Norwich Sewage Div.
P. Cotton.
Effluent and Water Treatment Journal, Vol 17, No 7, p 331-332, 335, July, 1977.

Descriptors: *Analog computers, *Digital computers, *Automation, *Monitoring, *Data collections, Flowmeters, Sewage sludge, Electric power, Dissolved oxygen, Suspended solids, Waste water treatment, Treatment facilities, Municipal wastes.

The collection and storage of data in waste water treatment facilities by automatic computer operation is evaluated. Analog and digital computer data can be displayed at the monitoring site or transmitted to the central control room for processing or display. Printed logs of treatment facility data are processed and provided by central processing units. Analog systems are being replaced by digital and direct digital control systems that are more reliable. Data collected in the treatment facility can be used for automatic control, daily operation in manually-controlled plants, evaluation of plant efficiency, accumulation of a data base for future design reference, and specific data investigations. Physical parameters measured in treatment facilities include: flows and volumes; settled sewage, sludge, and process liquor measurement; and energy usage. Analyses provided by computer control include: dissolved oxygen levels; suspended solids contents; sludge density; and thermal digestor gas values. (Lisk-FIRL)
W78-06472

THE MEMBRANE FILTER PLATE,
Severn-Trent Water Authority, Birmingham (England).
B. R. Edmondson, and D. R. Brooks.
Water Services, Vol 81, No 975, p 272, 274-278, May, 1977. 3 fig, 6 tab.

Descriptors: *Membrane processes, *Dewatering, *Sludge treatment, *Filters, *Membranes, Plastics, Pressure, Lime, Copper, Separation techniques, Waste water treatment, Municipal wastes.

A sludge press equipped with membrane filter plates which can be stopped at the optimum point of the cycle is evaluated. Recess and membrane filter plates are mounted alternately within the press to provide flexible and fixed surfaces. At a predetermined sludge level, the press apparatus is stopped and the sludge is squeezed at a pressure of 827 kilopascals for a duration required to produce the desired cake solids content. The dewatering efficiency of the membrane filter plate system was examined in pilot plant tests conducted with sludge which had been conditioned with lime and copper. A comparison of the membrane filter plate and the recess press showed a 37-133% increase in dry solids produced by the membrane filter press at feed times of 150-180 min. Further tests indicated that the press cycle could be reduced to 45 min for sludges that are easily dewatered. The dry solids content of the sludge cake could be controlled by the pressing time. A press converted to the membrane filter plate process could produce an increase in output of up to 50% over conventional press operation; this output could increase by 100% under automated operation. (Lisk-FIRL)
W78-06473

MODIFYING MANNING'S EQUATION FOR FLOW RATE ESTIMATES,
For primary bibliographic entry see Field 8B.
W78-06475

HOW CHLORINE AFFECTS SOLUBLE COD IN ALGAL LADEN SYSTEMS,
J. L. Wigkt, B. A. Johnson, J. H. Reynolds, and E. J. Middlebrooks.
Water and Sewage Works, Vol 125, No 3, p 48-52, 54, March, 1978. 14 fig, 3 tab, 20 ref.

Descriptors: *Chlorination, *Disinfection, *Chemical oxygen demand, *Laboratory tests, *On-site tests, Chlorine, Algae, Biochemical oxygen demand, *Sewage lagoons, Treatment facilities, Waste water treatment, Municipal wastes, Illinois.

The impact of chlorination on soluble COD concentrations in waste water containing high levels of algae was analyzed in laboratory tests and in experiments conducted at the Logan City, Illinois, municipal sewage treatment lagoons. When chlorine doses of 4.2, 16.9, and 50.8 mg/liter. In the laboratory studies, soluble COD concentrations in the chlorinated algae-bearing effluent increased from an initial 24.31 mg/liter to a high of 38.73 mg/liter and from an initial 52.70 mg/liter to a high of 70.37 mg/liter after treatment with chlorine at a dose of 50.8 mg/liter. COD concentrations increased substantially during the first 15 min of chlorine contact. Corresponding increases were not observed in field studies of COD concentrations after chlorine disinfection. In field experiments, soluble COD increases in algal laden waste water were apparent only for unfiltered sewage lagoon effluent having a free chlorine residual. Oxidation of organic substances by free chlorine residual. Oxidation of organic substances by free chlorine residuals where sand filtration was not employed contributed to the soluble COD increases. (Lisk-FIRL)
W78-06477

FILTRATION MEDIUM FOR BIOLOGICAL TREATMENT OF WASTE WATER -- SUPPORT ESPECIALLY OF PLASTIC COATED WITH GRANULAR MATERIAL.
Belgian Patent BE-855-426. Issued December 6, 1977. Derwent Belgian Patents Abstracts, Vol Y, No 50, p 1, January, 1978.

Descriptors: *Activated carbon, *Biological treatment, *Plastics, *Patents, Sands, Filtration, Solids contact processes, Adsorption, Biological membranes, Microbial degradation, Porous media, Chemical wastes, Waste water treatment.

A patent has been issued for a plastic-supported biological filtration system having a granular coating which effectively increases the surface area available for microorganism growth. The waste water is treated in an aerated filter coated with a granular material, such as activated carbon and sand. The surface area of the roughened activated carbon coating is increased by a factor of 30,000. The granular surface of the biological filter provides a more conductive environment for microorganism attachment. The filtration medium is mounted on a plastic or ceramic material, such as polyvinyl chloride, polystyrene, or polypropylene. The granular activated carbon coating on the filter media is also more effective in the treatment of chemical contaminants in the waste water. (Lisk-FIRL)
W78-06478

AEROBIC BIOLOGICAL PURIFICATION OF FLUID WASTES--BY INTENSIVE CIRCULATION IN TANK CONTAINING HIGH CONCENTRATION OF MICROORGANISMS.
French Patent FR-2342-254. Issued October 28, 1977. Derwent French Patents Abstracts, Vol Y, No 50, p 4, January, 1978.

Descriptors: *Biological treatment, *Aerobic treatment, *Activated sludge, *Patents, *Aeration, Oxygen, Centrifugation, Pumps, Circulation, Design data, Equipment, Waste water treatment.

A patent has been issued for an activated sludge aeration process which employs intensive circulation and high microbial concentrations to treat organic waste water. Waste water is introduced through an overspill into an aeration tank containing a bacteria count of 10,000-100,000 mg/liter. Air is mixed with the liquid as it is pumped through a distributor into the tank. The aerated waste water is fed into the tank at a rate rapid enough to promote intensive circulation. Constant circulation in the tank is maintained by sprinklers, connected to the pump, which spiral the waste water back into the tank. The liquid is delivered to a flotation tank where a centrifugal decanter removes sludge from the waste water for recycling. The clarified water is removed via an outlet at the bottom of the tank. The process does not require compressors of filters, reduces operating and capital costs, and produces a dewatered sludge. (Lisk-FIRL)
W78-06479

PRESSING LIQUID FROM SLUDGE ESPECIALLY SEWAGE SLUDGE--IN DECREASING GAP BETWEEN TWO RISING SURFACES, E.G., DRUM AND BELT.
French Patent FR-2343-701. Issued November 10, 1977. Derwent French Patents Abstracts, Vol. A, No. 1, p 3, February, 1978.

Descriptors: *Sewage sludge, *Dewatering, *Filtration, *Screens, *Patents, Impervious membranes, Sludge treatment, Pressure, Design data, Equipment, Waste water treatment.

A patent has been issued for a sludge dewatering device consisting of impermeable membranes or filter screens mounted on a drum and a conveyor belt. The device provides lateral water removal as well as screen filtration. The impermeable pressing surface is mounted on the circumference of a rotary drum. The second surface is a peforated, continuous conveyor belt which is driven by a motorized pulley. Increasing contact between the drum and belt as the sludge moves from the inlet to the outlet provides increasing pressure. As the pressure increases, the water in the sludge is expelled laterally from the press surfaces and is blown into a collection tank by compressed air jets. The press reduces filter screen clogging by allowing more water to escape laterally from the sludge. (Lisk-FIRL)
W78-06480

DEEP SHAFT SYSTEM USES GRP.
Water and Waste Treatment, Vol. 21, No. 1, p 25, January, 1978.

Descriptors: *Glass-reinforced plastics, *Aeration, *Waste disposal wells, *Underground waste disposal, *Injection wells, *Corrosion control, Chlorides, Industrial wastes, Plastics, Resins, Reinforcement, Protective coatings, Waste water treatment, Municipal wastes.

Corrosion resistant glass-reinforced plastic was employed in the construction of a deep shaft effluent treatment facility where the equipment would be exposed to high chloride concentrations in the industrial effluent treated with municipal wastes at the Marsh Farm Sewage Works in Tilbury, Essex, England. Effluent is aerated as it is passed down through the 132 m downcomer with a 1,200 mm diameter. The downcomer construction required corrosion resistance for an anticipated life span of 30 years. Glass-reinforced plastic tubes, in 10 m lenghts, provided the required resistance to the corrosive chloride concentrations and the necessary mechanical strength to hang freely in alignment with the supporting shaft. The plastic sections were joined together by locks and injected with resin, providing durability under high tensile loads. The bell-mounted T piece, through which the effluent enters the downcomer, was also constructed of glass-reinforced plastic. (Lisk-FIRL)
W78-06481

SEPTAGE COMPOSTING,
Pio Lombardo and Associates, Boston, MA.
P. Lombardo.
Compost Science, Vol. 18, No. 6, p 12-14, November-December, 1977. 4 fig, 2 tab, 5 ref.

Descriptors: *Septic tanks, *Degradation(Decomposition), *Sludge treatment, *Aeration, *Domestic wastes, Volatility, Suspended solids, Biochemical oxygen demand, Chemical oxygen demand, Farm wastes, Sawdust, Wood wastes, Waste water treatment, Pilot plants.

Pilot plant studies were conducted in Rehoboth, Massachusetts, to evaluate the treatment of domestic wastes from septic tanks by aerated and static pile composting with sawdust, woodchips, and animal manure. The dumping of septic wastes from three towns in the municipal waste treatment facility was prohibited because of the quantities of suspended, volatile, and total solids, as well as mean BOD and COD concentrations of 5,000 mg/liter and 45,000 mg/liter, respectively. Composting treatment of the septic wastes was preferred over chlorination, chemical treatment, anaerobic or aerobic treatment, lagooning, sand drying, land application, and disposal in a waste treatment facility or sanitary landfill. The high moisture content of the waste was reduced by the addition of sawdust and woodchips for moisture absorption; nitrogen was supplied by manure. Forced aeration and static pile composting were used at an asphalt drainage site. After manual mixing, the compost reached a maximum temperature of 163F at 5-10 days after pile construction. The estimated cost of a composting facility with a daily capacity of 15,000 gal from the three towns was $240,000. (Lisk-FIRL)
W78-06482

USING PLANTS FOR WASTEWATER TREATMENT,
California Univ., Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 5G.
W78-06483

MECHANIZED SLUDGE COMPOSTING AT DURHAM, NEW HAMPSHIRE,
R. Wolf.
Compost Science, Vol. 18, No. 6, p 25-26, November-December, 1977.

Descriptors: *Aeration, *Biodegradation, *Sewage treatment, *Sludge treatment, *Treatment facilities, Sludge digestion, Degradation(Decomposition), Waste water treatment, Municipal wastes.

A municipal sewage treatment facility planned for Durham, New Hampshire, will combine a secondary treatment plant with a sludge composting facility located within the plant. An aerated pile composting system with woodchip amendments was chosen for the sludge treatment system. The filtered sludge and woodchip mixture will be stored and aerated for 21 days on a concrete pad outside the plant and will have channels and screens for mounting the aerators. The daily loading time required for processing the 30 cu yds of sewage sludge produced each day is estimated at one hour. Six employees will be required to run both the secondary treatment plant, costing more than $6 million, and the composting system, costing $600,000. Wood and brush deposited at the municipal incinerator will be shredded to provide woodchips for the sludge composting process. Sludge processing costs are estimated to decrease from the experimental $15/yd to $8/yd with woodchip production and reuse. The composted sludge will be sold for turf production, erosion control, and landscaping. (Lisk-FIRL)
W78-06484

A GRAYWATER SOIL TREATMENT SYSTEM,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
R. Laak.
Compost Science, Vol. 18, No. 6, p 29-32, November-December, 1977. 2 fig, 4 tab, 23 ref, 1 append.

Descriptors: *Septic tanks, *Domestic wastes, *Anaerobic conditions, *Biochemical oxygen demand, *Suspended solids, Flow separation, Soil disposal fields, Waste water treatment, Sewage disposal, Water utilization.

A pretreatment tank, an anaerobic upflow filter, and a leaching field system were developed for the separate treatment of domestic graywater. The pollutant parameters of gray water, comprising 40-70% of the total domestic waste flow, were considerably lower than those for combined sewage containing black water. The soluble BOD concentration of the gray water was higher than that of sewage. The required pretreatment tank capacity for a 6 person residence was calculated at 600 gal, providing a three year cleaning period for solids removal was established. Heat transfer to the surrounding soil and exit velocity reduction was accomplished by a tank length-to-width ratio of 3:1 and an inlet-outlet height difference of 0.1-0.2 m. Effective BOD and suspended solids reduction in the gray water after pretreatment was achieved by an anaerobic upflow filter. The fixed media filter reduced BOD levels in pretreated gray water from 150 mg/liter to 100 mg/liter and suspended solids from 120 mg/liter to 80 mg/liter. The treated gray water was then discharged into a leaching field that required a 40% smaller length and 50% smaller interface area than the conventional septic tank soil field. Phosphorus and nitrogen loading of the soil by gray water was six times less than that of septic wastes. (Lisk-FIRL)
W78-06485

BASIC SEWAGE TREATMENT FOR SMALL COMMUNITIES.
Water Services, Vol. 81, No. 982, p 760-761, December, 1977.

Descriptors: *Pumping plants, *Rural areas, *Sewage treatment, *Pipes, *Valves, Distribution, Waste water treatment, Sludge treatment, Equipment, Design data, Treatment facilities, Settling basins, Municipal wastes.

A compressed air-operated sewage ejector type pumping plant for rural use where small sewage volumes are encountered is described. The plant, manufactured by Adams-Hydraulics Ltd, utilizes a 100 mm diameter pipe and valves; storage of sewage effluent is not required and clogging is avoided. The single or duplicate ejector systems of the duplicate centrifugal pumps are now available as prefabricated units, eliminating the need for constructing a permanent housing. The ejector system of the pumping plant, used in conjunction with settling tanks for full sewage treatment in isolated areas, is equipped with a rotary distributor providing overhead self-dosing and feed. An air release valve has been designed for use with sewage mains. The valve provides an 'in-line' flow pattern, as well as the conventional small and large orifices. The ejector can be located adjacent to the air compressor, which can be run on industrial air supplies in factories or at a distance from the air compressor plant. (Lisk-FIRL)
W78-06486

ORANGE COUNTY AUGMENTS WATER SUPPLY WITH RECLAMATION SYSTEM.
Water and Sewage Works, Vol. 125, No. 1, p 34-37, January, 1978. 1 fig, 1 tab.

Descriptors: *Reverse osmosis, *Saline water intrusion, *Saline water barriers, *Inorganic compounds, *Water management(Applied), Water supply, Water supply development, Water table, Injection, Saline water-freshwater interfaces, Hydrodynamics, Mineralogy, Membrane processes, Cellulose, Waste water treatment, Municipal wastes.

A reverse osmosis-demineralization operation in Fountain Valley, California, provides high quality waste water which, when mixed with well water and injected into the ground, prevents sea water intrusion and supplements the county water supplies. Sewage effluent is initially treated in the municipal waste water treatment plant by chemical clarification, ammonia removal, recarbonation, filtration, activated carbon adsorption, and chlorine disinfection. Before reverse osmosis membrane filtration, the waste water is treated with scale inhibitors, cartridge filtration, chlorination, and pH adjustment. Dissolved minerals in the waste water are removed by the reverse osmosis system consisting of 210 cellulose acetate elements housed in fiberglass-reinforced plastic pressure tubes 21 ft long with 8 in diameters. After 90% mineral removal, the effluent is mixed with water obtained from four deep zone wells, each providing 2 million gal of water daily. The water mixture is injected into the groundwater through a series of 23 injection wells which distribute 10% of the water mixture to the ocean as a hydraulic barrier system. The reverse osmosis demineralization system, with a capacity of 2045 gal/min, cost $3 million and is the largest system of its kind in full operation. (Lisk-FIRL)
W78-06487

TRUCK-TANKERS CLEAN SEPTIC TANKS IN RURAL AREAS,
R. Dyment.
Water and Sewage Works, Vol. 125, No. 1, p 49, January, 1978.

Descriptors: *Septic tanks, *Pumps, *Rural areas, *Rotors, *Domestic wastes, Sludge disposal, Filters, Return flow, Fertilizers, Landfills, Treatment facilities, Waste water treatment, Municipal wastes.

A 4,000 gal sewage tanker truck is used by Rural Sanitation Service, Inc, of Clarence, New York, to clean septic and holding tanks in unsewered areas. Sewage is removed from the septic tanks by a rotary stainless steel Vane pump with continuous vacuum pressure. The rotor is equipped with sliding vanes mounted aong the rotor's circumference. When the vanes are pushed outward by centrifugal force, the rotor casing is divided into separate compartments. The volumetric capacity of these compression compartments is maximized during rotation, causing air to be drawn in and compressed. Air is cleaned in the compressor by an oil filter and is prevented from flowing out through the air receiver by a non-return vlave. Sewage pumped from the septic tanks to the tanker truck is removed either to a municipal treatment facility, a sanitary landfill, or to a farm where it is used in land applications. The sewage sludge is buried in trenches 8-10 inches below the field surface in batches of 1500 gal for land fertilization. (Lisk-FIRL)
W78-06488

SEWAGE ODOR CONTROL WORKS IN BELOIT, WISCONSIN,
Will Ross, Inc., Milwaukee, WS.
For primary bibliographic entry see Field 5G.
W78-06489

CAROUSEL FOR CIRENCESTER.
Water and Waste Treatment, Vol 20, No 12, p 31, 34, December, 1977. 1 fig.

Descriptors: *Activated sludge, *Aeration, *Treatment facilities, *Screens, *Irrigation practices, Sludge treatment, Domestic wastes, Sludge disposal, Waste water treatment, Municipal wastes.

A patented Carousel activated sludge aeration system has been installed in the new Cirencester sewage treatment plant in England which was designed to provide service for a population of 25,000. The English-Dutch Carousel treatment process provides extended aeration and activated sludge purification in a large tank containing four channels for circular aeration. Primary treatment consists of grit removal and screening, with solids removed to a landfill. After aeration, the effluent is pumped to settling tanks for sludge and liquid separation. The liquid is filtered in a land area for removal of dissolved nutrients and suspended

solids. A screeing unit will be installed to remove large solids such as plastics and rags from the sludge before application to agricultural land. The waste treatment plant is automatically controlled and requires only one attendant. (Lisk-FIRL)
W78-06490

FOOTPATH GOES THROUGH SEWAGE WORKS.
Water and Waste Treatment, Vol 20, No 12, p 35-37, December, 1977.

Descriptors: *Biological treatment, *Treatment facilities, *Piles(Foundations), *Concrete structures, *Settling basins, Sewerage, Reinforcement, Storm water, Sludge treatment, Dewatering, Waste water treatment, Municipal wastes.

Piled foundation and combined treatment structures were incorporated into the design of the new municipal waste treatment facility at Saffron Walden, Essex, England. Pile foundations from 26-30 m deep were required to compensate peat and alluvial soil upon which the 5.16 million liter/day treatment facility was constructed. The visual impact of the plant was modified by the construction of low profile structures. Treatment processes, such as the pumping operation and the effluent polishing microstrainers, were combined within the same structure to accomodatate the restricted plant area. Influent is screened and degritted before passing to the primary settling basins. The four bioliogical membranes filters required 325 concrete piles for foundation support. Two humus filters and two microstrainers provide secondary treatment and polishing. Sludge from the settling basins is thickened and retained in three storage tanks for landfill disposal of further treatment. Flows that exceed three times the dry weather flow are routed to storm water storage tanks for eventual treatment or overland flow filtration. (Lisk-FIRL)
W78-06491

UPRATING SEDIMENTATION TANKS.
Water and Waste Treatment, Vol 20, No 12, p 40, December, 1977. 5 fig.

Descriptors: *Settling basins, *Flocculation, *Suspended solids, *Construction materials, *Plastics, Flow augmentation, Sludge, Separation techniques, Settling velocity, Particle size, Waste water treatment, Municipal wastes.

A sedimentation tank adjunct, the TPS module developed by CJB Developments Ltd of Portsmouth, England, enlarges the surface area in a humus tank for increased suspended solids flocculation without increasing tank volume. The stationary TPS unit is constructed of durable plastic. Suspended solids, in the effluent descent through the module until they hit a series of spaced, inclined plates. The inclined plates direct the particles into corrugated plates containing troughs located beneath the inclined plates. As the solids collection in the trough increases, larger flocs with high settling velocities form. The settling rate of the flocs exceeds the upward flow rate of the incoming waste water. The TPS modules increase the settling capacity of upward flow humus tanks when installed just below the surface level. Horizontal flow tanks can be improved by installed just below the surface level. Horizontal flow tanks can be improved by installing the module in the second part of the tank with a baffle extended across the width to create an upward flow chamber. The TPS module was designed to correct flow conditions in overloaded tanks. (Lisk-FIRL)
W78-06492

80 ACTUATORS AT ONE WORKS.
Water and Waste Treatment, Vol 20, No 12, p 37, December, 1977.

Descriptors: *Treatment facilities, *Penstocks, *Valves, *Automatic control, *Storm water, Aerators, Settling basins, Sewage treatment, Automation, Waste water treatment, Municipal wastes.

The Penybont sewage treatment works at Ogmore-by-Sea, Wales, includes an automatic flow system controlled by Rotork motorized penstock and valve actuators. The treatment facility, which processes wastes that were formerly discharged directly into the Bristol Channel, has a present capacity of 12 mgd and a designed expansion up to 16-21.5 mgd. Over 80 Rotork actuators control all the valves and penstocks within the main treatment plant. The treatment facility has a capacity of 108 mgd storm water flow, of which 36 mgd receive full treatment while the rest is stored in settling tanks before discharge. The aeration tanks and the feedback channels from the storm water tanks are equipped with the Rotork valve actuators which provide fully automatic control. Rates of flow from the aeration tanks are automatically controlled by outlet weirs that operate according to the dissolved oxygen level in the activated sludge. Monitors also assess treatment capacity in the plant and channel stored storm water into the treatment process when capacity is not at maximum. (Lisk-FIRL)
W78-06493

SEWAGE FARMING...WHY IT MAY BE IN YOUR FUTURE.
For primary bibliographic entry see Field 5G.
W78-06494

EFFLUENT AND WATER TREATMENT AT AERE HARWELL,
Atomic Energy Research Establishment Harwell (England).
J. B. Lewis.
Effluent and Water Treatment Journal, Vol 17, No 7, p 348-351, July 1977.

Descriptors: *Radioactive waste disposal, *Radioactive wastes, *Surface runoff, *Domestic wastes, *Chemical wastes, Treatment facilities, Sludge disposal, Chemical precipitation, Ion exchange, Waste water treatment.

A sewage treatment installation at the Atomic Energy Research Establishment in Harwell, England, separates the various active and inactive waste flows and stores them for individual treatment. The daily water supply of 7,000 cu m is supplied from the Thames River by a water works 10 km away. Drainage systems installed at the research station separate into individual treatment tanks the surface and roof runoff, the domestic sewage, the inactive trade wastes from laboratories, workshops and cooling circuits, and the radioactive effluents. The surface runoff is checked for radioactivity before discharge into a land ditch near the treatment works. Treated domestic sewage is retained in holding tanks for radioactive testing before discharge into the land ditch. Sludge is treated with aluminum chlorohydrate, dried on sand filters, and buried nearby. Industrial wastes are clarified and chemically treated before discharge through a 10 km pipeline to the Thames River. The active wastes, containing between 0.0001-0.00001 microcuries of radioactive particles/ml, are pumped to two brick tanks for ferric hydroxide precipitation. The effluent is discharged to the Thames and the sludge is dewatered and buried in Cumbria. Radioactive effluent with levels higher than 0.0001 microcuries/ml is precipitated with calcium phosphate-ferric hydroxide or calcium phosphate-copper ferrocyanide. (Lisk-FIRL)
W78-06496

ORGANIC FLOCCULANTS MARKET SET FOR BIG GROWTH,
W. J. Storck.
Chemical Engineering News, Vol 56, No 4, p 9, 11, 1978.

Descriptors: *Polymers, *Coagulation, *Flocculation, *Lime, *Sludge, Industrial wastes, Waste water treatment, Sludge disposal, Treatment facilities, Municipal wastes.

The efficiency and economics of organic flocculants were compared to those of alum as a coagulant. Traditional coagulation chemicals are alum, lime, and some ferric or ferrous compounds. Organic flocculants such as polyamines, polyacrylamides, and polyepichlorohydrins are more efficient because of their electrical charge. Organic coagulants can be anionic, cationic, or nonionic polymers with mixed charges. A dose of 100 ppm of polymer can replace up to 1,000-5,000 of alum, although many plants are designed to handle the large sludge-producing alum or lime treatments. Alum costs about $129/ton, compared to polymers which may up to $2,700-5,000/ton. Polymers are preferred as flocculants over raw material monomers; they have the primary advanantage of significantly reducing the production of sludge, a major disadvantage of alum and lime treatment. (Lisk-FIRL)
W78-06497

$30 MILLION ONE-MAN WASTE TREATMENT PLANT.
Journal of the Institution of Engineers (Australia), Vol 49, No 28, p 6, December, 1977.

Descriptors: *Sludge digestion, *Treatment facilities, *Screens, *Settling basins, *Digestion tanks, Methane, Carbon dioxide, Drying, Incineration, Fertilizers, Municipal wastes.

A $30 million waste water treatment plant under construction at the mouth of Australia's Brisbane River will contain a digger elevator, an aluminum gantry, and a transfer carriage for the automated treatment of effluent from a population of 430,000. Municipal and industrial wastes are automatically screened upon entering the plant. The removed solids are pressed and incinerated and the waste water undergoes grit removal. The degritted effluent is subjected to primary sedimentation in a series of tanks which remove about two-thirds of the suspended solids. Scapers convey the settled solids to six primary digestion tanks. The sludge is retained in the digestion are used as fuel for electric power generators. After digestion, the sludge is stored in two open tanks and later dried on an 11-acre drying bed. The dried sludge is used as a fertilizer or land fill. (Lisk-FIRL)
W78-06498

REMOVAL OF POWDERED ACTIVATED CARBON FROM WATER BY FOAM SEPARATION,
New Hampshire Univ., Durham. Dept. of Civil Engineering.
P. L. Bishop.
Separation Science and Technology, Vol. 13, No. 1, p 47-57, 1978. 5 fig, 2 tab, 14 ref.

Descriptors: *Activated carbon, *Foam separation, *Surfactants, *Aeration, *Separation techniques, Foaming, Cations, Hydraulic systems, Suspended solids, Waste water treatment, Municipal wastes.

The use of powdered rather than granular activated carbon in water and waste water treatment is limited by available techniques for removing the carbon from the treated suspension for regeneration. Foam separation with a cationic surfactant was evaluated for carbon suspension in tests with a continuous reaction. Compressed air was introduced into the bass of the 10 cm-diam reactor column at a rate of 0.4-0.8 standard cu ft/min/sq ft. The cationic surfactant, ethylhexadecyldimethyllammonium bromide, was added as the foaming agent in doses of 30, 50, and 70 mg/liter. Powdered carbon was completely removed from the effluent with a surfactant dose of 30 mg/liter and a liquid flow rate of 0.3-0.6 gal/min/sq ft. About 1% of the influent load was removed as foam; a 30 mg/liter

surfactant dose resulted in an effluent surfactant content of 8.6-12.1 mg/liter. Column design modifications and more efficient aeration were suggested for greater removal of the surfactant from the effluent. Activated carbon regeneration was enhanced by a lower aeration rate and surfactant dosage; effluent quality was improved by higher aeration rates, lower hydraulic loading, and lower surfactant dosages. Foam separation with a surfactant was more efficient in powdered activated carbon removal than air flotation alone. (Lisk-FIRL)
W78-06500

BUTANE IS NEARLY 'IDEAL' FOR DIRECT SLURRY FREEZING,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
C. W. Randall.
Water and Wastes Engineering, Vol. 15, No. 3, p 43-44, 47-49, March, 1978. 4 fig, 1 tab.

Descriptors: *Freezing, *Sludge treatment, *Continuous flow, *Dewatering, *Suspended solids, Activated sludge, Heat transfer, Boiling, Ice, Treatment, Analytical techniques, Waste water treatment, Municipal wastes.

Direct slurry freezing of waste water sludge with butane as the cooling agent was evaluated with batch and continuous flow reactors. The batch reactor, with a sludge volume of 1.5 liters, had a large surface area than the 2 liter continuous flow reactor; the larger surface area increased the heat transfer rate, minimizing sludge detention times. The effectiveness of batch treatment was dependent upon the sludge detention time in the reactor and the quality of the filtrates. Higher suspended and dissolved solids concentrations in the sludge required longer detention times in the continuous flow reactor for adequate treatment. A sludge cake solids concentration of 77% was achieved after vacuum filtration and gravity drainage in batch tests, compared to 18% concentration without sludge conditioning and 40% for continuous flow tests. Recovery of 40-60% of the butane after treatment was accomplished with a single compressor. The addition of a second compressor increased butane recovery to 70-80%. The direct slurry freezing process was competitive with other sludge treatment methods at an estimated cost of $6-20/ton dry solids processed. (Lisk-FIRL)
W78-06501

WHAT TO CONSIDER IN BASKET CENTRIFUGE DESIGN,
Envirex, Inc., Waukesha, WI.
L. G. Hagstrom, and N. A. Mignone.
Water and Wastes Engineering, Vol. 15, No. 3, p 58, 60, 62, 1978. 3 fig, 5 ref.

Descriptors: *Centrifugation, *Sludge treatment, *Dewatering, *Turbulence, *Activated sludge, Solid wastes, Gravity, Separation techniques, Waste water treatment, Municipal wastes.

Parameters involved in the effective design of a bottom feed, continuous batch basket centrifuge for sludge dewatering were examined in studies with sludge samples from five municipal treatment facilities. Basket centrifugation, which removes cavity and capillary water, is used to dewater or thicken feed slurry, skimmings dewatered cake, and centrate. The slurry to be dewatered during centrifugation is passed into a bowl via a continuous 360 degree slot in the bowl floor. Turbulence and slippage of the sludge in the bowl is reduced by this entrance scheme. Samples of contact stabilized, extended aerated, and activated sludge from the five treatment facilities were dewatered in the basket centrifuge tests. Results indicated that cationic polymer additions enhanced machine throughputs and solids recovery. At constant feed rates and polymer additions, increasing sludge ages decreased the machine throughput and significantly affected solids recovery but not cake concentration. (Lisk-FIRL)
W78-06502

WASTEWATER PURIFICATION IN BIOLOGICAL TREATMENT PONDS WITH ALGAL GROWTH (OCHISTKA STOCHNJIKH VOD V APBGAPIZIROBANNJIKH BIOPRUDAKH),
A. N. Tereshina.
Vodosnabzhenie i Sanitarnaia Tekhnika, No. 9, p 25-26, 1977. 1 tab, 9 ref.

Descriptors: *Sewage lagoons, *Algae, *Nutrient removal, *Biological treatment, *Sewage treatment, Design data, Sewage bacteria, E. coli, Waste water treatment.

Experiences with the use of algal ponds in the biological treatment of municipal waste water are presented. The algal ponds have depths in the range of 0.6-0.9 m and are sectioned. They are established on impermeable ground where possible and are sealed with polyethylene foil in permeable regions. They are initially seeded with algae (Cyanophyta, Diatomaea, and Chlorophyta) at a dosage of 300 mg/25 cu m of water. The waste water throughput is generally in the range of 400-1,000 cu m/day at a hydraulic load of 800-1,375 cu m/ha/day and an organic matter load of 106-137 kg/ha/day. After 99.9% of the E. coli are destroyed, the treated waste water is drained off via pipes installed above the bottom. The treatment efficiency and chlorophyll synthesis rates are comparable for algal ponds in the Baltic region and in Central Asia, in spite of the considerable differences in climate and temperature. (Takacs-FIRL)
W78-06503

MINI SEWAGE WORKS.
Water Services, Vol. 81, No. 982, p 760, December, 1977. 1 fig.

Descriptors: *Aeration, *Screens, *Settling basins, *Weirs, *Treatment facilities, Separation techniques, Aerated lagoons, Equipment, Design data, Hydraulic structures, Waste water treatment, Sludge treatment, Municipal wastes.

A municipal sewage treatment unit, developed by Simon-Hartley of Stoke-on-Trent, England, provides extended aeration for small volumes of municipal effluent. The treatment unit is designed for simple operation in municipal facilities where volumes of sludge produced are limited or in warm climates where sludge is used for irrigation. The compact unit treats fluctuating flows in communities where sewage output may increase several fold at certain periods of the day. The Capitox treatment unit uses initial coarse screening of influent, followed by the mixing of the raw sewage with recirculated sludge before aeration. A Simcar earator is employed; a weir box passes the liquid effluent into the settling basin containing an inlet stilling box and a weir. Solids are screened before leaving the aeration tank; sludge is removed from the settling tank and returned to the beginning of the treatment cycle for mixing with the influent. Tanks are constructed of either steel or concrete from a variety of components, dependent upon the specific application. (Lisk-FIRL)
W78-06504

SOLVING SLUDGE BULKING PROBLEMS,
J. L. Barnard.
Water Pollution Control, Vol. 77, No. 1, p 103-106, 1978. 1 fig, 2 ref.

Descriptors: *Bulk density, *Sludge treatment, *Treatment facilities, *Bacteria, *Sphaerotilus, Activated sludge, Dissolved oxygen, Nitrates, Industrial wastes, Nitrification, Sulfides, Carbohydrates, Nutrient requirements, Biochemical oxygen demand, Waste water treatment, Municipal wastes.

The identification and elimination of sludge bulking problems caused by treatment deficiencies or by bacterial population shifts were reviewed. Low dissolved oxygen levels in mixed liquor were conducive to the growth of Sphaerotilus natans, a filamentous bacteria causing bulking. Increasing the oxygen load or adding 5-19 mg/liter of chlorine to the return sludge was effective in inhibiting the growth of filamentous bacteria. Incorporating a nitrification-denitrification phase of operation into the treatment system was also an effective debulking method. Sulfide loads in the effluent feed from septic wastes or pulp mill effluents were reduced by oxidation to sulfates in a biological filter or by aeration without the addition of activated sludge. Nutrient deficiencies in the waste water were alleviated by maintaining a nitrogen:phosphorus:BOD ratio in excess of 5:1:150. Pretreatment of high carbohydrate effluents with anaerobic processes or biological filtration reduced sludge bulking problems. Sludge age up to 60 days, identified as a bulking problem, was rectified by more frequent wasting of sludge under 30 days old. Dairy wastes contributing to shock loads were effectively treated with batch aeration followed by settling. PH variations caused by excessive nitrate formation were controlled by providing an anoxic zone to denitrify the nitrates and increase the pH to a neutral value. (Lisk-FIRL)
W78-06506

BIODEGRADATION OF SOME CATIONIC SURFACTANT AGENTS (BIODEGRADATION DE QUELQUES AGENTS DE SURFACE CATIONIQUES),
Monpellier-2 Univ. (France). Lab. d'Hydrobiologie.
For primary bibliographic entry see Field 5B.
W78-06507

LEAK DETECTOR.
For primary bibliographic entry see Field 5G.
W78-06508

VERSATILE WASTEWATER FLOWMETER,
Water Services, Vol 81, No 981, p 685-686, November, 1977.

Descriptors: *Digital computers, *Flowmeters, *Flow measurement, *Flow rates, *Depth, Analytical techniques, Pipelines, Channel flow, Flumes, Hydraulic gradient, Measurement, Data collections, Monitoring, Automation.

The digital QSFM4 waste water flowmeter, developed by Quantum Science Ltd., accurately measures the depth of flow in pipes, channels, or flumes. The digital system employs a series of 20 vertical thermistors, each representing 5% increments in flow. Data obtained by the thermistors on flow increments is transcribed by the digital instrument into gal/hr, gal/day, liters/hr, or liters/day. Total and maximum flows are automatically computed; note is made of the number of times the flow has exceeded a preset flow limit. The digital flowmeter is capable of operating external automatic analyzers or samplers within a preset schedule. The flowmeter can be modified to show rate of loss of a substance, such as calories. Accuracy is maintained by the digital unit to ensure integrated readings. (Lisk-FIRL)
W78-06511

A STUDY ON THE LOADING AND PERFORMANCE OF SEWAGE TREATMENT PLANTS,
For primary bibliographic entry see Field 5A.
W78-06512

COMPUTER CONTROLS PIPELINE FLOW.
For primary bibliographic entry see Field 8G.
W78-06513

AIRBORNE ENTERIC BACTERIA AND VIRUSES FROM SPRAY IRRIGATION WITH WASTEWATER,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
For primary bibliographic entry see Field 5A.
W78-06515

NOVEL COMBINATION METHOD ASSESSES SEWAGE ODORS,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5A.
W78-06516

PROGRAMMING PHOSPHATE TREATMENT SAVES MONEY,
Camp, Dresser and McKee, Inc., Boston, MA.
R. H. Culver, and D. Chaplick.
Water and Sewage Works, Vol 125, No 3, p 84-87, March, 1978. 2 fig, 3 tab, 1 ref.

Descriptors: *Phosphorus, *Nutrient removal, *Coagulation, *Flocculation, *Chemical precipitation, Treatment facilities, Phosphates, Analytical techniques, Sludge, Sampling, Waste water treatment, Municipal wastes.

An alum treatment schedule based on observed hourly variations in phosphorus concentrations was developed for the Pittsfield, Massachusetts, municipal waste water treatment plant. Random sampling of the effluent for phosphorus concentration data proved to be an inefficient basis upon which to calculate alum requirements. Alum additions of 300 mg/liter prior to screening and grit removal reduced effluent phosphorus to 0.8 mg/liter but produced large volumes of sludge with a solids content of 2%. To avoid anerobic digester failure, alum doses were reduced to 200 mg/liter, reducing effluent phosphorus to 1.5 mg/liter. Hourly sampling of the influent over a seven day period indicated that the peak phosphorus flows occurred from 10 a.m. to 12 midnight. With a 20:1 alum-to-phosphorus ratio for treatment, alum was wasted when additions were made on the bais of daily average phosphorus flow. An individual schedule for each day of the week established adequate alum doses with respect to hourly phosphorus data. Simplification of the schedule to eight daily manual additions of the varying alum doses provided the most effective reduction of phosphorus with the most efficient plant operation. (Lisk-FIRL)
W78-06517

ORGANOCHLORINATED RESIDUES IN WASTEWATERS BEFORE AND AFTER TREATMENT,
Laval Univ., Quebec. Dept. des Vivres.
G. B. Martin, and C. Gosselin.
Journal of Environmental Sciences and Health, Vol A13, No 1, p 1-11, 1978. 2 fig, 3 tab, 8 ref.

Descriptors: *Polychlorinated biphenyls, *DDD, *DDT, *Organic pesticides, *Chlorinated hydrocarbon pesticides, Waste water treatment, Gas chromatography, Sampling, On-site investigations, Sewage treatment, Chlorination, Municipal wastes, Analytical techniques.

The removal efficiency of polychlorinated biphenyls, DDT, and other organochlorine compounds present in municipal waste water was studied at a treatment facility in Valcartier, Quebec, Canada. Samples of waste water were collected at the plant inlet and outlet over a five-day period and over a 24-hour period. All samples were analyzed by gas chromatography with electron capture detectors. The municipal facility provided primary and secondary treatment with chlorination. Daily sampling over the five-day collection period yielded a polychlorinated biphenyl concentration range of 0.50-2.00 ppb at the inlet and 0.02-0.60 ppb at the outlet. DDD ranged from traces to 0.07 ppb at the inlet and 0.03 ppb at the outlet. DDT concentrations were as high as 0.08 ppb at the inlet and 0.02 ppb at the outlet. Mean reductions from the inlet to the outlet of the organochlorine compounds during the 24 hr collection were 0.29-1.38 ppb for polychlorinated biphenyl and 0.03-0.08 ppb for DDD. According to the chromatographs, the higher chlorinated polychlorinated biphenyls were more easily removed during treatment than the lower chlorinated compounds. Concentrations of lower chlorinated compounds were increased by the treatment process. A 75% reduction of polychlorinated biphenyls was achieved by the treatment process; DDD and DDT were also eliminated. (Lisk-FIRL)
W78-06518

PROCESS SYNTHESIS AND INNOVATION IN FLUE GAS DESULFURIZATION,
California Univ., Berkeley.
G. T. Rochelle.
Available from University Microfilms International, Ann Arbor, MI 48106; Order No. 77-31519. PhD Thesis, 1977, 577 p.

Descriptors: *Sulfur compound, *Air pollution, *Slurries, *Steam stripping process, *Hydrogen sulfide, Ammonia, Sodium compounds, Magnesium compounds, Oxidation, Waste treatment, Industrial wastes.

Innovations and alternatives in stack gas desulfurization processes are evaluated. Conventional desulfurization processes, such as aqueous scrubbing with disposal of CaS03 and CaS04, hydrogen sulfide regeneration, and steam stripping, are considered. Sulfopropionic acid, oxalic acid, and adipic acids are suggested as supplementary buffereing agents. Magnesium oxide, ammonia, sodium carbonate, and ethylenediamine are recommended as alkali additives. A suggested improvement in the aqueous scrubbing process involves the oxidation of the scrubbing slurry and buffer additives in the scrubber loop. Partial hydrogen sulfide regeneration of the recycled solution is recommended to eliminate bisulfite. Steam stripping process improvements include the use of boiler evaporation for stripping the slurry of buffer acid or pyrosulfite and the return of condensates from the process to the stripper. (Lisk-FIRL)
W78-06519

COMPARISON BETWEEN ADSORPTION OF POLIOVIRUS AND ROTAVIRUS BY ALUMINUM HYDROXIDE AND ACTIVATED SLUDGE FLOCS,
Texas Univ. Health Science Center at Houston. Dept. of Virology and Epidemiology.
S. R. Farrah, S. M. Goyal, C. P. Gerba, R. H. Conklin, and E. M. Smith.
Applied and Environmental Microbiology, Vol 35, No 2, p 360-363, February, 1978. 4 tab, 25 ref.

Descriptors: *Polioviruses, *Viruses, *Activated sludge, *Aluminum, *Flocculation, *Enteric bacteria, Analytical techniques, *Adsorption, Diseases, Microorganisms, Treatment, Waste water treatment, Municipal wastes.

Aluminum hydroxide and activated sludge floc adsorption of poliovirus and simian rotavirus (SA-11) was studied in laboratory experiments. The simian rotavirus was used in place of human rotavirus which was difficult to isolate and culture. Aluminum hydroxide adsorption reduced the titer of added poliovirus by three logs. A one log reduction in simian rotavirus concentrations was achieved with aluminum hydroxide. Human rotavirus was not significantly adsorbed onto aluminum hydroxide flocs. Activated sludge flocs adsorption of the viruses resulted in an 0.7-1.8 log reduction in poliovirus and a 0.5 log reduction in simian rotavirus. The results indicated that poliovirus was more readily adsorbed than rotavirus. An estimated reduction of the viruses by adsorption onto both activated sludge and aluminum hydroxide flocs predicted the predomination of rotavirus after waste water treatment. The use of model viruses such as reovirus to predict the fate of viruses in waste water treatment was considered. (Lisk-FIRL)
W78-06520

IS INADEQUATE SLUDGE AGE AND DISSOLVED OXYGEN CONTROL PREVENTING OPERATORS FROM GETTING THE BEST FROM THEIR ACTIVATED-SLUDGE PLANTS,
A. R. Pitman.
Water Pollution Control, Vol 77, No 1, p 97-99, 1978. 1 fig.

Descriptors: *Activated sludge, *Dissolved oxygen, *Flocculation, *Suspended solids, *Optimization, Oxygen demand, Bacteria, Protozoa, Waste water treatment, Sludge digestion, Municipal wastes.

The optimization of the activated sludge waste water treatment process is considered with respect to sludge age and dissolved oxygen control. Clarifier capacity increases at a constant feed rate of homogenous sludge and a dissolved oxygen level of 2 mg/liter. As sludge age increases under these circumstances, effluent clarity improves due to increased bioflocculation efficiency; the sludge settling rate increases with higher floc density; and the quantity of sludge produced decreases. The oxidation of organic nitrogen and ammonia also improves while the floc oxygen demand and mixed liquor suspended solids increase. As sludge age increases, optimum conditions are approached. These include the reduction of the protozoa population, the presence of bacteria in the endogenous growth phase, the deterioration of bioflocculation, and the continuing increase of floc density, suspended solids, total oxygen demand, and clarifier solids levels. When sludge age exceeds the optimum conditions, deflocculation occurs. Two examples of effluent deflocculation are presented. In one case, control of the dissolved oxygen level below capacity improves the clarified effluent quality. In the second case, reducing sludge age improves the ambient dissolved oxygen level. (Lisk-FIRL)
W78-06521

PRODUCTION OF SYNRINGEALDEHYDE FROM HARDWOOD WASTE PULPING LIQUORS,
Domtar Ltd., Montreal (Quebec). (Assignee).
H. B. Marshall, and D. L. Vincent.
United States Patent 4,075,248. Issued February 21, 1978. Official Gazette of the United States Patent Office, Vol 967, No 3, p 1105, February, 1978. 1 fig.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Lignins, *Organic compounds, *Hardwood, Patents, Waste water treatment, Design data, Alkalis(Bases), Sodium compounds, Inorganic compounds, Industrial wastes, Solvent extraction, Oxidation.

A process for the production of syringealdehyde from lignin-bearing kraft pulping liquors has been patented. The hardwood draft pulping liquor is mixed with an alkali and introduced into an oxidation reactor. The liquor is oxidized under high temperature and presure and then neutralized. The oxidized, neutralized liquor is removed with an organic solvent which separates the organic fraction of the liquor from the lignin-bearing aqueous fraction containing incorganic chemicals. The aqueous solution is returned to the kraft pulping process for the recovery of alkalis. The organic fraction is treated with sodium bisulfite in an aqueous solution to form an aqueous solution containing the sodium the bisulfite complex of syringealdehyde and vanillin. The organic fracton is removed and the aqueous solution is washed with an aliphatic alcohol containing a chain of 4-6 carbons. Acidification of the aqueous solution results in the break-

down of the complex to an oil consisting of syringealdehyde and vanillin. Fractional distillation is employed to separate the syringealdehyde from the vanillin. (Lisk-FIRL)
W78-06542

DEWATERING OF WASTEWATER TREATMENT WASTES,
Swift and Co., Chicago, IL. (Assignee).
E. R. Ramirez.
United States Patent 4,071,447. Issued January 31, 1978. Official Gazette of the United States Patent Office, Vol 966, No 5, p 1873-1874, January, 1978. 1 fig.

Descriptors: *Dewatering, *Sludge treatment, *Patents, *Aeration, *Design data, Bubbles, Equipment, Sludge, Waste water treatment, Municipal wastes.

A patent has been issued for a process to dewater effluent treatment wastes, such as sludges or skimmings, using aeration and a vertical column. Coagulated waste resulting from primary treatment of precipitation is introduced into the lower inlet of a vertical chimney. An aeration source, located below the waste inlet, supplies air bubbles to the dispersed wastes. A polymer flocculant is added, below the waste inlet and above the aeration source, to bring about the formation of buoyant composites with the coagulated materials in the waste. These buoyant composites are confined within the vertical column by the limitation of horizontal movement. The waste-bearing air bubbles move upwardly through the vertical chimney, forming an upper stratum of impurities. The lower stratum within the vertical column, containing clarified water, is separated from the waste-bearing upper stratum. (Lisk-FIRL)
W78-06543

METHOD AND DEVICE FOR THE WET COMPOSTING OF ORGANIC SLUDGE,
H. Gujer.
United States Patent 4,072,494. Issued February 7, 1978. Official Gazette of the United States Patent Office, Vol 967, No 1, p 207-208, February, 1978.

Descriptors: *Biodegradation, *Sludge treatment, *Oxidation, *Patents, *Hydrostatic pressure, Equipment, Design data, Flow control, Waste water treatment, Sludge disposal.

A continuous flow, wet composting method for organic sludge treatment has been patented. Oxygen-bearing gas is introduced into sludge contained in an air-tight mixing tank. A composting reaction is promoted as the oxygen is passed through the sludge flowing through an air-tight container. Static pressure is built up by the composting reaction and maintained at 1-6 atmospheres. A temperature of more than 55C and less than 75C is maintained within the air-tight tank as the composting reaction occurs. (Lisk-FIRL)
W78-06544

REGULATING OXYGEN INPUT IN TREATMENT OF EFFLUENT,
Farbenfabriken Bayer A.G., Leverkusen (West Germany). (Assignee).
T. Gorski, A. Heinem, and K. Mack.
United States Patent 4,071,443. Issued January 31, 1978. Official Gazette of the United States Patent Office, Vol. 966, No. 5, p 1872-1873, January, 1978. 1 fig.

Descriptors: *Oxygen, *Aeration, *Oxidation, *Patents, *Sludge treatment, Activated sludge, Design data, Equipment, Waste water treatment, Shear strength, Shear, Municipal wastes.

A patent has been issued for a waste water aeration treatment system which improves oxygen use and diminishes activated sludge particle size. Sewage effluent containing activated sludge is mixed in a double tank aeration chamber and oxygenated with a gas containing 20% oxygen. Gas bearing 40-80% oxygen by volume is introduced into the gas space within the first vessel containing the waste water. Gas is applied until the effluent has an oxygen content of 1-4 mg/liter. The aerated effluent is passed from the first tank into the second tank where the gas in the air space has an oxygen content of 30-60% by volume. The effluent is again sprayed with gas and oxygen until the oxygen content reaches 4-8 mg/liter. Effluent in the second tank is returned to the first treatment stage where it is mixed with fresh effluent in the amount of 10-300% by volume. Activated sludge solids are reduced to between one-third and one-twentieth of their original size by the shear force. (Lisk-FIRL)
W78-06560

A BRANCH AND BOUND METHOD FOR USE IN PLANNING REGIONAL WASTEWATER TREATMENT SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
E. D. Brill, Jr., and M. Nakamura.
Water Resources Research, Vol. 14, No. 1, p 109-118, February 1978. 7 fig, 1 tab, 24 ref.

Descriptors: *Alternative planning, *Waste water treatment, *Branch and bound method, *Cost minimization, Regional systems, Economies of scale, Networks, Constraints, Linear programming, Evaluation, Optimization, Algorithms, Mathematical models, Equations, Systems analysis.

A branch and bound method is presented for evaluating alternative regional wastewater treatment systems, accounting for economies of scale in constructing treatment plants and interceptor sewers. A branch and bound tree is 'grown' an algorithm which is very efficient computationally because it uses a powerful inspection step and a network algorithm to solve subproblems. Each infeasible solution found by using the method is converted to a feasible regional configuration of plants and interceptors. The alternative plans can be compared to examine tradeoffs between cost and other qualitative and quantitative planning objectives. Also the tree itself can be extended to generate additional planning alternatives. Rather than to find mathematically optimal solutions, the principal uses of the method are to generate systematically attractive alternative plans and potentially to assist in evaluating tradeoffs between different planning objectives. The method is used herein to minimize the total cost of treatment plants and piping; the concave cost functions are piecewise linear. (Bell-Cornell)
W78-06565

CLEANING APPARATUS FOR SEWER PIPES AND THE LIKE,
For primary bibliographic entry see Field 8G.
W78-06568

OZONATION OF MAKE-UPWATER FOR SALMONIC FISH REARING FACILITIES,
Idaho Univ., Moscow. Dept. of Bacteriology and Biochemistry.
P. J. Colberg, L. L. Edwards, A. J. Lingg, T. J. Morrison, and A. T. Wallace.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 555, Price codes: A04 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, August 1977. 51 p, 10 fig, 22 ref, 3 append. OWRT A-053-IDA(3). 14-34-0001-6013.

Descriptors: *Ozone, *Fish hatcheries, Fish management, Salmonids, Ammonia, Algae, Nitrates, Nitrites, *Economic efficiency, *Idaho, Fishkill, *Water pollution, Clearwater River(Idaho), Dworshak National Fish Hatchery(Idaho), Biochemical oxygen demand, *Ozonation, Pilot plants, Water reuse, Recycling, *Waste water treatment, *Cost comparisons.

An ozone pilot plant was installed at the Dworshak National Fish Hatchery to examine the efficacy of sterilizing makeup water entering this recycle hatchery. The pilot plant consisted of two separate systems operated together. A recycle system consisting of two fish tanks, a clarifier and biofilter was in operation prior to this study. An ozone system consisting of a Grace ozone generator (later replaced by a Welsbach generator) and a Grace contacting column was installed for this study. The ozone pilot plant supplied the makeup water to the existing recycle system. The pilot plant was run with approximately 125 pounds of cutthroat and one-half pound of steelhead fry. Recycle rate was 30 GPM and makeup rate was 3 GPM. At the conclusion of the pilot plant study, an economic comparison was made of an ozone system and an ultraviolet system. The basis for comparison was proposed 650 GPM system to be installed at Dworshak. Although the ozone treatment system requires a capital investment of $164,000 as opposed to $90,000 for an equivalent size ultraviolet system and an annual cost of almost $17,000 as opposed to $12,000 for the UV system, this study demonstrates the increased cost may be justified. The ozone system gave consistently greater sterilization efficiency than the ultraviolet system. It also showed consistently lower ammonia level and more uniform BOD concentrations. All of these effects would enhance fish survival.
W78-06579

EVALUATION OF THE EFFICACY OF SULFITE PULP MILL POLLUTION ABATEMENT USING OYSTER LARVAE,
Washington State Dept. of Fisheries, Brinnon.
For primary bibliographic entry see Field 5C.
W78-06609

STUDY OF FOAM SEPARATION AS A MEANS OF DETOXIFYING BLEACHED KRAFT MILL EFFLUENTS: THEORETICAL ASSESSMENT OF ENGINEERING REQUIREMENTS AND AVAILABILITY OF COMMERCIAL EQUIPMENT.
B. C. Research Ltd., Vancouver.
Canadian Forestry Service, Ottawa, Ontario. Cooperative Pollution Abatement Research (CPAR) Project Report to March 31, 1975. 96 p, 25 fig, 6 illus, 21 ref, 9 tab, 8 append.

Descriptors: *Pulp wastes, *Bleaching wastes, *Foam separation, *Waste water treatment, *Toxicity, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Turbine, Costs, Operating costs, Water purification, Equipment, Engineering, Engineers estimates, Aeration, Centrifugation, Separation techniques, Water quality control, Kraft mills, Black liquor.

Foam separation is a technically and economically feasible process for toxicant removal from total bleached kraft mill effluents. Process requirements and equipment specifications for foam separation treatment of 94,500 cu m/day (25 M gal/day) of effluent from a bleached kraft mill of 750 tons/day (680 tons/day) capacity were defined and submitted to various equipment suppliers. The system had to be capable of generating 30 sq m/liter/hr of gas-liquid interfacial area at gas/liquid ratios of ca. 5 within 1-hr retention time while operating with minimum attention and practically trouble-free under all northern climatic conditions. Its foam-breaking subsystem had to collapse ca. 56.6 cu m/min (2000 cu ft/min) of foam entrained with 5% of liquid. Manufacturers quotations, laboratory results, and literature data were reviewed and used to evaluate various available systems. Turbine, helical, and jet aeration systems all appeared to meet these requirements in conjunction with foam-rupturing systems based on

impact, shearing, and compression forces. Recommended for pilot-plant evaluation was a jet aerator system which produces micron-size bubbles, permits long contact times for enhanced toxicant absorption, leaves the liquid surface free of impediments to foam removal, and is simple to install and operate. Along with it, a centrifugal turbine foam breaker marketed as skum slaker was recommended, based on its successful operation in several North American kraft mills for foam control in black liquor oxidation towers and effluent foaming towers. Operating costs for a 12-jet foam-generating aerator and 18 skum slakers of 22.4 kw (30-hp) at a 750-ton/day kraft mill discharging 25 M gal/day effluent were estimated at $2.10/metric ton of pulp ($2.31/tonne). (Brown-IPC)
W78-06610

DETOXIFICATION AND DECOLORIZATION OF KRAFT PULP MILL EFFLUENTS USING ACTIVATED CARBON,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong, T. Tenn, R. A. Wostradowski, and S. Prahacs.
Canadian Forestry Service, Ottawa, Ontario K1A 0H3, Cooperative Pollution Abatement Research (CPAR) Project Report 246-1, Final Report October 1973 - July 31, 1974. 79 p, 9 fig, 39 ref, 10 tab, 7 append.

Descriptors: *Pulp wastes, *Waste water treatment, *Toxicity, *Color, *Activated carbon, *Kraft mills, Wastes, Industrial wastes, Pulp and paper industry, Effluents, Water pollution treatment, Water pollution sources, Canada, Foreign countries, Bleaching wastes, Softwood, Carbon, Hydrogen ion concentration, Fly ash, Costs, Capital costs, Operating costs, Aeration, Biochemical oxygen demand, Aluminum, Sulfates, Resin acids, Fatty acids.

A micro-pilot apparatus for testing the Pulp and Paper Research Institute of Canada carbon treatment process has been constructed and started up. Eight series of test runs were completed, using samples of combined-mill or bleachery effluents from an Eastern Canadian kraft mill. Aeration in presence of catalytic amounts of C, followed by addition of alum plus electrolyte, detoxified combined-mill and bleachery effluents to meet Federal government regulations which specify 80% or better survival of test fish over a 96-hr exposure at 65% bioassay concentration. The optimum dosages for softwood bleached kraft effluent were 200 mg of C and 300 mg of alum/liter. Resin and fatty acid concentrations did not correlate with effluent toxicity. The process functioned well within the pH range 3.8-6.8, which is typical of most bleached kraft combined mill effluents. Flyash (bark char from hog-fuel furnaces) seemed an acceptable substitute for commercial activated C. Decoloration depended primarily on the alum dose applied. The doses required for detoxification (300 mg alum plus 200 mg C/liter) typically achieved 75-85% color removal, but only 20-30% BOD removal. The preferred process scheme, viz., a single-pass treatment with mixtures of 85% flyash plus 15% commercial activated C, is estimated to require $1.9 million in capital expenditure for a bleached kraft mill of 500 air-dry tons/day capacity, plus ca. $5.10/air-dry ton of operating cost. An alternative scheme involving on-site production and regeneration of carbon would be more expensive, but would assure independence of quantitative and qualitative changes in bark char supplies from hog-fuel furnaces. (Brown-IPC)
W78-06611

REDUCTION OF TOXICITY OF CONDENSATES FROM SULFITE WASTE LIQUOR EVAPORATORS,
Eco-Research Ltd., Pointe Claire (Quebec).
M. A. Wilson, R. LeBlanc, and I. Middelraad.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 324-1, Final Report to March 31, 1975, 45 p, 3 fig, 7 ref, 10 tab.

Descriptors: *Sulfite liquors, *Pulp wastes, *Toxicity, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Biochemical oxygen demand, Activated sludge, Waste water treatment, Toxicity, Evaporation, Hydrogen ion concentration, Chemical oxygen demand, Aeration, Organic matter, Carbon, Condensates, Sulfite pulp mills, Acetic acid, Furfural, Eugenol, Juvabione, Abietic acid, Spent sulfite liquor.

Spent sulfite liquor evaporator condensates were found to contribute less than 10% to total sulfite pulp mill effluent toxicity, but 28% to the total effluent's BOD. Toxic constituents of condensate were identified as acetic acid, furfural, eugenol, juvabione, and abietic acid. Neither steam stripping nor extended-aeration activated sludge treatments produced nontoxic condensate. However, evaporation of spent sulfite liquor at pH 7 reduced the COD and total organic carbon (TOC) of the condensates and hence of the total mill effluent. (Brown-IPC)
W78-06613

DETERMINATION OF TOXICITY LOADS FOR BLEACH PLANT EFFLUENTS,
B. C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5A.
W78-06616

THE FATE OF SUPPLEMENTAL NUTRIENTS IN AERATED LAGOONS.
Beak Consultants Ltd., Montreal (Quebec).
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 387-1, Final Report to September 30, 1975. 60 p, 5 fig, 40 ref, 14 tab, append.

Descriptors: *Pulp wastes, *Aerated lagoons, *Waste water treatment, *Nutrients, Waste treatment, Waste, Industrial wastes, Water pollution sources, Water pollution treatment, Nitrogen compounds, Phosphorus compounds, Biological treatment, Publications, On-site investigation, Pulp and paper industry, Effluents, Biochemical oxygen demand.

The fate of P and N compounds added to effluent-treating biological aeration lagoons was investigated by (1) a literature survey, (2) a questionnaire survey sent to 23 pulp and paper mills (of which 14 responded), and (3) a field evaluation of two operating aerated lagoons. There was no correlation between amounts of supplemental nutrients added and treatment efficiency or other system criteria. However, both N and P are required for microbial growth. The total concentration of these two nutrients remains essentially constant throughout an aerated lagoon. Changes in P and N compounds do take place, however, and are related to the extent of aeration and the 5-day BOD loading. High-rate processes require more nutrients than low-rate treatments. Recommendations for proper nutrient addtion are presented. (Brown-IPC)
W78-06618

THE EFFECT OF CHEMICAL TREATMENT ON THE TOXICITY OF PULP AND PAPER MILL EFFLUENTS,
Beak Consultants Ltd., Vancouver (British Columbia).
J. C. Coss, and D. F. Wilson.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 393-1, Final Report to November 30, 1975. 48 p, 6 fig, 19 ref, 7 tab, 3 append.

Descriptors: *Pulp wastes, *Waste water treatment, *Toxicity, Coagulation, Wastes, Waste treatment, Water pollution treatment, Water pollution sources, Lethal limit, Fish, Color, Pulp and paper industry, Effluents, Iron compounds, Aluminum, Sulfates, Organic matter, Chemical precipitation, Iron chloride, Resin acids.

The detoxification of a bleached kraft mill waste water by treatment with alum of ferric chloride is reported. Either coagulant eliminated the effluent's original toxicity which was ca. 30% in terms of LC(50), i.e., the concentration at which 50% of test fish survived 96-hour exposure. In addition, up to 95% of resin acids and color, 50-70% of total organic matter, and 20-30% of biodegradable matter were removed, depending on effluent characteristics. (Brown-IPC)
W78-06619

IDENTIFICATION OF TOXIC MATERIALS IN SULFITE PULP MILL EFFLUENTS,
B.C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5A.
W78-06620

TREATMENT OF EFFLUENT,
D. Parnaby.
United States Patent 4,075,095. Issued February 21, 1978. Official Gazette of the United States Patent Office, Vol 967, No 2, p 1064-1065, February, 1978. 1 fig.

Descriptors: *Filtration, *Settling basins, *Sludge disposal, *Separation techniques, *Patents, Design data, Equipment, Sands, Filters, Scum, Waste water treatment, Municipal wastes.

A patent has been issued for a settling tank containing a sand filter bed and scum trough for the separation of sludge from clarified water. The settling tank is divided into a scum tank and a ballast chamber. The scum tank contains a filter bed and medium on a perforated support at the top. Effluent is introduced into the tank through a feed valve located below the perforated filter. The effluent is fed into the filter and sludge settles to the lower portion of the scum tank. The filtered liquor is pumped through a scum trough. Scum is removed by the perforated support before effluent is discharged via a weir. The ballast chamber, located below the support, contains an outlet and a back pressure monitor. A valved gas outlet releases gas when a predetermined back pressure is attained. The filter is backwashed when required by dropping the level of effluent in the tank. (Lisk-FIRL)
W78-06621

SETTLING TANK SLUDGE COLLECTOR,
E. D. Blalock.
United States Patent 4,075,109. Issued February 12, 1978. Official Gazette of the United States Patent Office, Vol 967, No 3, p 1069, February, 1978. 1 fig.

Descriptors: *Sludge treatment, *Settling basins, *Sumps, *Patents, Equipment, Waste water treatment, Design data, Sludge disposal, Electric motors, Municipal wastes.

A patent has been issued for a flat bottomed tank which provides settling and scraping of treated sewage sludge. The tank is equipped with a bracket mounted, electric motor-driven bridge which traverses the length of the chamber. A wheel containing a pneumatic tire rotates around a vertical axis attached to the bridge and parallel to the tank wall and operates by the bridge motor. The tire is maintained in contact with the adjacent wall by a gravitational force established by a rotating plate connecting the support bracket to the wheel and motor. A sludge scraper frame equipped with a transverse center bar and a scraper blade is mounted on one of the longitudinal side members of the frame; it is supported in a horizontal position by the bridge. During sludge scraping, the

sludge scraper rotates about an inclined axis as it moves toward a sump at one end of the tank. The scraper returns to an idle position as it moves away from the sump. An elongated, curved cam plate, projecting out from the end wall to the side of the scraper frame, controls the angle of the sludge scraper frame. (Lisk-FIRL)
W78-06622

NEW BASIC TECHNIQUE FOR TREATMENT OF EFFLUENTS FROM PULP AND PAPER MILLS (NUEVA TECNICA BASICA PARA EL TRATAMIENTO DE EFLUENTES DE FABRICAS PASTERO-PAPELERAS),
La Plata Univ. (Argentina).
J. A. Montani Leguizamon, and M. F. Colmenarejo Morcillo.
Contaminacion y Prevencion, Vol 5, No 40, p 23-28, March, 1976. 2 fig, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Chemical precipitation, Wastes, Industrial wastes, Pulp and paper industry, Effluents, Water pollution sources, Water pollution treatment, Hydrogen ion concentration, Polyelectrolytes, Flocculation, Sedimentation, Carbon dioxide, Biochemical oxygen demand, Color, Economics, Water pollution control, Waste treatment, Kraft mills.

Following a review of the types of effluents stemming from the manufacture of pulp and paper (particularly from the manufacture of bleached kraft pulp), studies are outlined which led to a new basic technique for treating such effluents. The treatment is based on adjusting the effluent to a pH of 12.5 using causticizing mud and adding a polyelectrolytic flocculant. Solid contaminants are then removed via sedimentation, and the pH of the clarified effluent is adjusted to 6.5 using carbon dioxide (e.g., recovery boiler emissions). Such a treatment can reduce effluent BOD by 53% and total color by 97%. Pilot-plant and industrial applications of the process are discussed along with economic considerations. (Speckhard-IPC)
W78-06623

SLUDGE DEWATERING--AN IMPORTANT CONTRIBUTION TO ENVIRONMENTAL PROTECTION (SCHLAMMENTWAESSERUNG--EIN WICHTIGER BEITRAG ZUM UMWELTSCHUTZ).
Das Oesterreichische Papier, Vol 14, No 9, p 24, September, 1977. 1 fig, 1 tab.

Descriptors: *Sludge treatment, *Dewatering, *Equipment, *Pulp wastes, Wastes, Waste treatment, Water pollution sources, Water pollution treatment, Water pollution control, Performance, Pulp and paper industry, Sludge, Industrial wastes, Solid wastes, Dewatering press, Pressure, Presses, Pressing.

The Bellmer convergent-belt press is described, and some data on its performance in dewatering pulp and paper mill sludges are given. Throughput capacities range around 15-20 cu m/hr/m of belt width contacted by sludge; final dry solids contents amount to 30-35%. (Ward-IPC)
W78-06624

CONTROL OF CHEMICAL OXYGEN DEMAND IN PULP AND PAPER MILL EFFLUENTS (CONTROL DE LA DEMANDA QUIMICA DE OXIGENO EN LOS VERTIDOS DE CELULOSA Y PAPEL),
Instituto Nacional Investigaciones Agrarias, Madrid (Spain).
For primary bibliographic entry see Field 5A.
W78-06625

SEWAGE SLUDGE DISPOSAL,
Thiokol Corp., Newton, PA. (Assignee).
For primary bibliographic entry see Field 5E.
W78-06626

PROBLEMS WITH REUSE OF VETRNI PAPER MILL EFFLUENTS IN THE PULP MILL CONSIDERING THE CONCENTRATION OF SULFATE IONS (PROBLEMATIKA RECIRKULACIE VOD MEDZI PAPIERNOU A CELULOZKOU VO VETRNI Z HL'ADISKA OBEHU SIRANOVYCH IONOV),
Vyskumny Ustav Papiera a Celulozy, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 3E.
W78-06627

PAPER AND BOARD MILL EFFLUENT TREATMENT USING THE SONOFLOT EQUIPMENT (CISTENI ODPADNICH VOD Z VYROBY PAPIRU A LEPENKY NA FLOTACNIM ZARIZENI SONOFLOT),
Papcel Litovel (Czechoslovakia).
V. Gottfried.
Papir a Celuloza, Vol. 32, No. 7-8, p 199-201, 1977. 1 fig, 1 illus, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Flotation, *Equipment, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Waste treatment, Foreign countries, Europe, Pulp and paper industry, Effluents, Suspended solids, Sludge, Water pollution control, Czechoslovakia.

The Sonoflot unit was developed in Czechoslovakia, especially for paper mill effluent treatment. The unit works as a flotator with relatively high efficiency and small space requirements, which make it a good choice for individual paper or board machine effluent treatment. Since 1969, when the first unit was manufactured by the Papcel Company, numerous Czechoslovakian and foreign mills, including secondary-fiber board mills, have had favorable experience with these machines. The Sonoflot units are supplied in four sizes with throughputs ranging from 15 to 150 cu m/hr containing up to 1500 mg/liter of suspended solids. The capture rate of the flotator ranges from 85 to 98% and the sludge consistency is 0.5-3.0%. The unique part of the Sonoflot flotator is the generator of hydrodynamic pulses designed to disperse air into small bubbles. (Trubacek-IPC)
W78-06628

PROCESSING OF PAPER MILL EFFLUENT TREATMENT SLUDGES (ZPRACOVANI ODPADNICH KALU Z CISTENI PAPIRENSKYCH ODPADNICH VOD),
IRAPA, Prague (Czechoslovakia). Vyvojovy a Racionalizacni.
For primary bibliographic entry see Field 5E.
W78-06629

PAPER MILL SLUDGE DEWATERING IN THE JINDRICHOV MILL (ZAHUSTOVANI PAPIRENSKYCH KALU V ZAVODE JINDRICHOV),
Olsanske Papirny (Czechoslovakia).
For primary bibliographic entry see Field 5E.
W78-06631

TREATMENT OF EFFLUENT FROM THE PRODUCTION OF FINE PAPER (CISTENI ODPANICH VOD Z VYROBY TENKYCH PAPIRU),
Olsanske Papirny (Czechoslovakia).
J. Homolova.
Papir a Celuloza, Vol. 32, No. 7-8, p 220-222, 1977. 1 fig, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, *Sludge treatment, *Dewatering, Wastes, Industrial wastes, Pulp and paper industry, Effluents, Water pollution treatment, Water pollution sources, Foreign countries, Europe, Sedimentation, Centrifugation, Equipment, Czechoslovakia.

The Olsany paper mill (Czechoslovakia) has an effluent treatment plant consisting of three sedimentation tanks. Two of the tanks are of the Satyr type, which consists of a circular welded tank divided vertically into three conical-bottom compartments. Sludge from all three funnel tips is pumped for dewatering while the water goes through the compartments in series. The third sedimentation unit is similar to the Satyr, but is equipped with a sludge rake mechanism. The sludge from all sedimentation tanks at a consistency of 1.8-1.9%, containing 30.2-35.8% of inorganics (determined as ash), was used for sludge dewatering pilot plant tests, carried out with the Andritz press were favorable for sludge from the production of fine papers. In comparison with the centrifuge, the SEM press gave higher final solids, quiet and reliable operation at lower energy usage, and performance relatively unaffected by intake consistency fluctuation. (Trubacek-IPC)
W78-06632

EFFLUENT TREATMENT PLANT SLUDGE MANAGEMENT IN THE PAPER MILL AT VRANE ON THE VLTAVA RIVER (KALOVE HOSPODARSTVI CISTIRNY ODPADNICH VOD V ZAVODE VRANE NA VLTAVOU),
Zapadoceske Papirny (Czechoslovakia).
For primary bibliographic entry see Field 5E.
W78-06633

PURE OXYGEN AND CONVENTIONAL AIR ACTIVATED SLUDGE TREATMENT PILOT PLANT EVALUATION FOR A PULP AND PAPER MILL WASTE,
Hydroscience, Inc., Westwood, NJ.
J. P. Watkins, T. J. Mulligan, and J. Shema.
Proceedings of the 31st Industrial Waste Conference, May 4-6, 1976, Purdue University (Lafayette, Indiana), p 206-217. 8 fig, 1 ref, 5 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, Biological treatment, Wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Oxygen, Air, New York, Pilot plants, Design, Operation and maintenance, Economics, Biochemical oxygen demand, Chemical oxygen demand, Sludge, Dewatering, Costs, Capital costs, Operating costs, Temperatures, Reliability, Sulfite pulp mills, Paper mills.

A comparison of oxygen- vs. air-aided biological sludge treatments was conducted at Finch Pruyn & Co. Inc.'s pulp and paper mill in Glen Falls, New York, which makes high-grade printing paper from ammonia-base sulfite pulp produced in a continuous digester (200 tons/day) and subjected to multistage bleaching with chlorine, NaOH, and hypochlorite. The pure-oxygen process used a package pilot facility supplied by Linde Division of Union Carbide Corp. (UNOX system). Design and operating parameters, including economics, of the two systems are contrasted. Although either system achieved BOD removals above 95% with proper operation, along with COD removals of ca. 80%, the combined primary plus UNOX secondary sludges were dewatered considerably better than the combined primary plus air-system secondary sludges. Vacuum filter loading rates were 2-5 times higher for the UNOX than the air-system sludge, and the former required no chemical conditioning. At nearly identical capital cost requirements, the UNOX system's operating costs were estimated significantly lower (471,600 vs. $556,700). Operating reliability should be equal, provided temperatures are properly controlled, which requires a precoling tower for the UNOX system. (Brown-IPC)
W78-06634

THE APPLICATION OF THE ICI DEEP SHAFT PROCESS TO INDUSTRIAL EFFLUENTS,
Imperial Chemical Industries Ltd., Billingham (England). Agricultural Div.
D. H. Bolton, D. A. Hines, and J. P. Bouchard.

Proceedings of the 31st Industrial Waste Conference, May 4-6, 1976, Purdue University (Lafayette, Indiana), p 344-351. 7 fig, 2 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Industrial wastes, *Pulp wastes, Wastes, Pulp and paper industry, Water pollution sources, Water pollution treatment, Microorganisms, Costs, Waste treatment, Effluents, Foreign projects, Europe, Effluents, Pilot plants, Sulfite pulp mills, Condensates, England, Germany.

The ICI deep-shaft biological effluent treatment process, developed as a spin-off from single-cell protein research makes use of a deep drilled shaft (70 ft or more) with concentric or adjacent upflow (riser) and downflow (downcomer) sections, in which a culture of effluent-purifying microorganisms is maintained. A British pilot plant has been operating on domestic sewage since mid-1974, and a full-scale German plant for starch waste has been built in 1975. The deep-shaft process is said to be suitable for wastes of other industries as well, including pulp and paper mill effluents. Cost estimates and process parameters for treating sulfite mill evaporator condensates are included among the examples given. (Brown-IPC)
W78-06635

AN OZONE REACTOR FOR COLOR REMOVAL FROM PULP BLEACHERY WASTES,
Case Western Reserve Univ., Cleveland, OH. Dept. of Chemical Engineering.
P. B. Melnyk, D. Judkins, and A. Netzer.
Proceedings of the 31st Industrial Waste Conference, May 4-6, 1976, Purdue University (Lafayette, Indiana), p 434-443. 14 fig, 10 ref, 3 tab.

Descriptors: *Ozone, *Waste water treatment, *Color, *Bleaching wastes, Wastes, Industrial wastes, Pulp wastes, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Costs, Operating costs, Capital costs, Temperature, Biochemical oxygen demand, Chemical oxygen demand, Oxygen, Recycling, Design, Chemical reactions.

The design of an ozone reactor along with estimates of capital and operating costs are presented, based on data for color removals and ozone consumptions measured on a kraft-mill caustic bleachery waste at 2 temperatures (29.5 and 60.5C) and two initial ozone concentrations (0.0106 and 0.0174 mole fractions). Changes in BOD and COD accompanying the decoloring effect are also reported. The reaction of ozone with color bodies is rapid. Its observable rate is a combined of the rates of chemical kinetics and mass transport. The oxygen-recycle system offers savings in both capital and operating expense over the air-feed system. (Brown-IPC)
W78-06636

REMOVAL OF COLLOIDAL TITANIUM DIOXIDE PIGMENT FROM AN INDUSTRIAL WASTE EFFLUENT,
Northeastern Univ., Boston, MA.
M. D. Walters, and I. W. Wei.
Proceedings of the 31st Industrial Waste Conference, May 4-6, 1976, Purdue University (Lafayette, Indiana), p 583-595. 13 fig, 12 ref, 3 tab.

Descriptors: *Pulp waste, *Titanium, *Waste water treatment, *Colloids, Pigments, Zeta potential, Coagulation, Turbidity, Filters, Sludge, Costs, Filtration, Water pollution sources, Water poliution treatment, Wastes, Industrial wastes, Pulp and paper industry, Settling velocity, Effluents, Operation and maintenance, Waste treatment, Newsprint, Titanium dioxide.

Although zeta-potential is a useful parameter for evaluating colloid stability, it could not be used for accurate predictions of either the coagulating point or the coagulant dose for the titania solutions studied. Turbidity was a valuable parameter to evaluate titania removals from the studied effluents. Settling rates of completely coagulated pigment solutions were rapid and produced rather clear supernatant effluents. The Trommel rotary filter was found to be well suited to removal of coagulated pigment sludges, but dimensions and operating criteria should be selected individually for each practical application. In analyzing the costs of newsprint for filtering dry solids, a relationship between solids yield and filtrate yield vs. form time was found which indicates that operation beyond 30 sec form time will minimize newsprint paper costs. (Brown-IPC)
W78-06637

PLANT CLOSES LOOP ON ITS WASTEWATER TREATMENT.
Environmental Science and Technology, Vol. 12, No. 3, p 260-263, 1978. 2 fig.

Descriptors: *Chemical wastes, *Fertilizers, *Ammonia, *Sulfur compounds, *Phosphorus compounds, Nitrogen, Potassium, Air pollution, Cooling towers, Fluorine, Waste water treatment, Industrial wastes, Water reuse.

Mississippi Chemical in Pascagoula, a manufacturer of sulfuric acid, phosphoric acid, anhydrous ammonia, and nitrogen, phosphorus, and potassium mixed fertilizers, has installed a 10-unit closed water treatment system. Scrubbing water from the fertilizer plants is pumped to a cooling tower where it is neutralized and the fluorine concentration reduced with caustic. Phosphoric acid production waste water is also circulated to a cooling tower. A storm water collection system routes all precipitation to a storage tank for use as makeup water in the fertilizer cooling tower. Decanted gypsum slurry water is retained in a holding tank before reuse as process water and gypsum slurry water. Chromate, added during ammonia production as an anti-corrosive, is reduced to less than 0.05 ppm by electrolytic precipitation. A neutralization facility removes acid impurities from the waste streams with lime precipitation, flocculation, clarification, and sludge removal. Oil and water from ammonia production are separated and filtered in a collection tank. Shell and tube heat exchanger water is conveyed to a cooling tower before discharge. Acidic emissions from the phosphate plant are scrubbed; scrubber water is maintained at pH in a storage pond. Ammonium phosphate fertilizer dust is purified by fabric filters located in seven baghouses. Emissions from the granulation, drying, and neutralizing operations are first scrubbed with phosphoric acid for solids removal, and then with a weaker solution of phosphoric acid for the removal of fluorine, ammonia, and dust. (Lisk-FIRL)
W78-06641

REMOVING SUSPENDED IMPURITIES FROM WASTE WATER FROM ACETYLENE PRODUCTION--BY CLARIFICATION AND TREATMENT WITH IRON SALTS AND POLYACRYLAMIDE.
Soviet Patent SU-247-866. Issued June 6, 1977. Derwent Soviet Inventions Illustrated, Vol. A, No. 3, p 2, February, 1978.

Descriptors: *Chemical industry, *Iron, *Chemical wastes, *Patents, *Water purification, *Calcium carbonate, Filtration, Slurries, Waste water treatment, Industrial wastes.

A process has been patented for the clarification of acetylene production waste water with iron salts and polyacrylamide. Cleaned waste water is treated with an iron salt, preferably in the amount of 0.5-0.8 mg/liter rather than 5-10 mg/liter. The waste water is further clarified by the addition of a polyacrylamide at a concentration of 0.05-0.1 mg/liter. The reduced iron salt requirement increases the degree of purification while reducing the treatment cost. The lower iron salt addition also prevents calcium carbonate deposition of the equipment and decreases the loss of acetylene to the slurry. Acetylene can be recovered by filtration. The slurry in the screening area is concentrated to 470 g/liter from 380 g/liter; the amount of clarification required is reduced to 0.20 mg/liter from 200-500 mg/liter. An example of the use of the process for the purification of acetylene production waste water is presented. (Lisk-FIRL)
W78-06642

MATHEMATICAL MODELS USEFUL IN EVALUATION OF ORGANIC WASTEWATER,
Chulalongkorn Univ., Bangkok (Thailand).
S. Sujarittanonta, J. H. Sherrard, and D. F. Kincannon.
Water and Sewage Works, Vol. 125, No. 1, p 38, 40-42, January, 1978. 6 fig, 2 tab, 11 ref.

Descriptors: *Food processing industry, *Mathematical models, *Activated sludge, *Organic wastes, *Chemical oxygen demand, Microbial degradation, Biological treatment, Analytical techniques, Kinetics, Waste water treatment, Industrial wastes.

The application of mathematical models for biological treatment of waste water to slaughterhouse effluent containing beef blood was evaluated in laboratory tests with activated sludge treatment. Beef blood, with COD values ranging from 10,000 mg to more than 70,000 mg/liter, was diluted to COD concentrations of 460, 1100, and 1570 mg/liter and introduced into activated sludge units containing microorganisms from an acclimated continuous flow unit. Retention times of the blood-bearing effluent in the activated sludge cells ranged from 4.6 to 15.0 days was nearly constant for the three organic loadings tested. Higher COD concentrations in the effluent increased the removal efficiency to greater than 91%. Effluent concentrations of COD were maintained below 50 mg/liter. The observed biological treatment data was compared to mathematical predictions that were based on mean cell residence time and biokinetic coefficients. Calculated values for the maximum microorganism yield coefficients were similar to observed values; energy coefficients for microorganism maintenance were lower. The beef blood in the effluent, the source of carbon and energy for microorganism metabolism, was thought to provide sufficient quantities of nutrients for growth without the need for synthesis reactions. (Lisk-FIRL)
W78-06643

EVALUATION OF BIRD CHILLER WATER FOR RECYCLING IN GIBLET FLUMES,
Richard B. Russell Agricultural Research Center, Athens, GA.
H. S. Lillard.
Journal of Food Science, Vol. 43, No. 2, p 401-403, 1978. 5 tab, 4 ref.

Descriptors: *Food processing industry, *Poultry, *Salmonella, *Coliforms, *Cooling water, Aerobic bacteria, Flumes, Biochemical oxygen demand, Chemical oxygen demand, Recycling, Waste water treatment, Bactericides, Industrial wastes.

The feasibility of recycling water from the processing of poultry, especially from the gizzard splitter and bird chiller stages to the giblet flumes, was examined by water quality analyses of each processing stage. A comparison of microbiological parameters in the water from giblet flumes and chillers indicated that the water in the gizzard, liver-heart, and neck flumes was of higher quality than the water in the corresponding chillers. Fecal coliform and aerobic bacteria counts for the bird chiller water were significantly higher than for the giblet flumes. Salmonella was detected in four out of 26 samples taken of bird chiller water; neck flume water, with one Salmonella incidence in 26

samples, was the only flume water exhibiting the pathogenic bacteria. Gizzard splitter samples displayed higher microbiological quality than any of the flume waters except for the gizzard flume. All chiller waters were found to contain Salmonella, evidenced as the serotypes S. bornum, S. california, S. heidelberg, S. infantis, S. senctenberg, and S. typhimurium. The gizzard splitter water was considered acceptable for recycling to the giblet flumes without bactericidal treatment. A comparison of BOD and COD levels in the water samples indicated that gizzard flume and bird chiller water contained the lowest levels of organic matter; gizzard splitter and neck chiller samples exhibited the highest organic loadings. Because of its lower BOD and COD content, bird chiller water was preferred over gizzard splitter water for bactericidal treatment and recycling to the giblet flumes. (Lisk-FIRL)
W78-06644

USE OF SPENT PICKLE LIQUOR IN WASTE TREATMENT, EVALUATION OF ELECTROLESS COPPER AND COPPER ETCHANT,
Agricultural Research Service, Peoria, IL. Northern Regional Research Center.
R. E. Wing, and W. E. Rayford.
Metal Finishing, Vol. 76, No. 3, p 31-33, March, 1978. 2 tab, 39 ref.

Descriptors: *Copper, *Iron compounds, *Copper compounds, *Ammonia, *Metals, Lime, Iron oxides, Reduction(Chemical), Waste water treatment, Industrial wastes.

Spent pickle liquor containing 5.5-8.0% ferrous iron was evaluated as a treatment medium in the removal of copper from quadrol-based electroless copper rinse water and from copper ammonia etchant rinse water. The disposal of pickling liquor, used in the removal of oxide scale from steel products, has been limited by stricker waste disposal regulations. Byproducts recovered from spent pickling liquor are iron compounds and ions, sulfuric acid, hydrochloric acid, and ammonium sulfate. The reduction of chromate in wastes can be accomplished by treatment with spent ferrous sulfate pickling liquor and neutralization. Quadrol-based electroless copper plating rinse waters, with concentrations of 50-1000 mg/liter, can be treated at pH 11.2-12.0 with pickling liquor additions of 10.6-53.0 ml to copper concentrations of 0.04-0.50 mg/liter. Neutralization to the indicated pH was accomplished with sodium hydroxide or lime. The treatment of copper ammonia etchant wash waters with pickling liquor additions of 2.65-10.6 ml reduced copper concentrations from 50 mg/liter to 0.15-27.21 mg/liter at pH 9.4-11.7. Results indicated that 3 gallons of spent pickling liquor with a ferrous ion content of 6.6% were required for the treatment of 1000 gallons waste water containing a 50 mg/liter concentration of copper-quadrol or copper ammonia rinse. (Lisk-FIRL)
W78-06645

RECOVERING NI/CR FROM PLATING WASTES.
Canadian Chemical Processing, Vol. 62, No. 2, p 28-31, February, 1978.

Descriptors: *Nickel, *Chromium, *Ion exchange, *Reverse osmosis, *Evaporation, Resins, Cellulose, Chemical wastes, Membranes, Metals, Waste water treatment, Industrial wastes.

The recovery of nickel and chromium from plating wastes with small, refined ion exchange, reverse osmosis, or evaporation units is reviewed. An ion exchange unit, developed by Eco-Tec Ltd of Toronto, Canada, utilizes a reciprocal flow ion exchanger that requires a small amount of resin. The rapid circulation of the waste water stream through the loading, regeneration, and washing processes produces a smaller amount of concentrated, bound metal on the exchange resin. The process for nickel recovery is completed within about 15 min; ion exchange recovery of chromium requires about 30-60 min. At least 99% of the nickel in the effluent stream is recovered at a cost of approximately $0.28 /kg of recovered nickel. The Eco-Tec system recovers 6 kg/hr of chromium oxide at a cost of $0.68/kg. Reverse osmosis systems are capable of recovering dissolved materials in the plating waste stream. A reverse osmosis system developed by Electrohomel Ltd of Kitchener, Ontario, utilizes a cellulose acetate membrane for almost complete recovery and 90% water recovery. A polybenzimidazolone membrane developed in Japan has a higher temperature range and a pH tolerance of 1-12. An evaporation unit, manufactured by Corning Glass Co of New York, has a capacity of 80 liters/hr and produces a highly concentrated solution; a steam supply of 90 kg/hr and 40 liters/min of cooling water are required for operation. Up to 525 g/liter of chromic acid can be maintained in the plating tank. (Lisk-FIRL)
W78-06646

ANALYSIS OF CYANIDES IN COKE PLANT WASTEWATER EFFLUENTS,
Envirodyne Engineers, Inc., St. Louis, MO.
For primary bibliographic entry see Field 5A.
W78-06647

REMOVAL OF EMULSIFIED OIL WITH ORGANIC COAGULANTS AND DISSOLVED AIR FLOTATION,
Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Civil Engineering.
R. G. Luthy, R. E. Selleck, and T. R. Galloway.
Journal Water Pollution Control Federation, Vol. 50, No. 2, p 331-346, February, 1978. 9 fig, 5 tab, 30 ref.

Descriptors: *Oil industry, *Oil wastes, *Polyelectrolytes, *Flocculation, *Flotation, Anions, Cations, Emulsions, Waste water treatment, Industrial wastes.

Laboratory and pilot plant experiments tested the effectiveness of dissolved air flotation with prior polyelectrolytic coagulation for the removal of emulsified oil recovered from petroleum waste water by American Petroleum Institute (API) separators. The kinetics of oil droplet-air bubble interfaces were also examined. The separator effluent contaning emuslified oil was coagulated with a series of anionic, nonionic, and cationic polyelectrolytes. A dosage of 15 mg/liter of the cationic polyelectrolyte WT 2640, consisting of 75% of a polydiallyldimethylammonium compound, provided the best reversal of electrokinetic mobility of the oil droplets at pH 8.0. Dissolved air flotation with the 75% charged WT 2640 of the emulsified oil effluent removed an average of 98.6% of the suspended oil. The pilot plant results indicated that good oil droplet coagulation and flocculation increased oil removal during dissolved air flotation. Polyelectrolyte dosage requirements were found to be independent of the concentratuion or composition of the emulsified oil. The dissolved air flotation involved saturation of the effluent with air at 345 kilopascals and release of the aerated effluent at atmospheric pressure into a flotation chamber. Air bubbles rising toward the surface carried emulsified oil droplets. The resulting surface foam containing the emulsified oil was removed by separators. Oil droplets coagulation to zero net charge established the most conducive oil droplet-air bubble interfaces for the dissolved air flotation process. (Lisk-FIRL)
W78-06648

PETROLEUM PROCESSING WASTE WATER PURIFICATION--BY NEUTRALISING WITH SULPHURIC ACID AND ELECTROLYSIS TO REMOVE NAPHTHENATES.
Soviet Patent SU-543-687. Issued March 10, 1977.
Derwent Soviet Inventions Illustrated, Vol. Y, No. 51, p 6, February, 1978.

Descriptors: *Oil industry, *Oil wastes, *Electrolysis, *Patents, *Organic acids, Anodes, Cathodes, Sulfur compounds, Waste water treatment, Industrial wastes.

A patent has been issued for a process to remove naphthenates from oil industry waste water by neutralization followed by electrolysis with long anodic impulse duration. The alkaline aqueous effluent from oil refineries, containing the naphthenates, is first neutralized to pH 7.0-7.5 with sulfuric acid. The naphthenates are then separated from the waste water by electrolysis with steel electrodes at a current density of 2.0-2.5 A/sq dm. The electrolytic separation process is accelerated by the use of an anodic impulse duration that is four times longer than the cathodic impulse duration through current reversal at 6-12 volts. This procedure also prevents the deposition of mud on the electrodes. Use of the treatment process is described for petroleum waste water containing 6,500 mg of naphthenic acid/liter with a pH of 12.3 and a transparency of 21 cm. After neutralization to pH 7.0-7.5, the effluent was electrolyzed for 12 min, yielding waste water with a transparency of 35 cm and a precipitate containing 95% naphthenates and 5% iron hydroxide. (Lisk-FIRL)
W78-06649

GAS FLOTATION TO RAISE AND REMOVE SLUDGE FROM TREATMENT TANKS--PARTICICULARLY OILY SLUDGE FROM OIL REFINERY SEPARATORS.
Netherlands Patent NL-7706-525. Issued December 20, 1977. Derwent Netherlands Patents Report, Vol. A, No. 2, p 2, February, 1978.

Descriptors: *Sludge disposal, *Sludge, *Oil wastes, *Oil industry, *Patents, Design data, Equipment, Aeration, Waste water treatment, Industrial wastes.

A patent has been issued for a flotation process to remove sludge, particularly oil refinery sludge, from the bottom of treatment tanks. The bottom of the tank is equipped wit air sparge pipes which inject compressed air into inverted collecting gutters that are angled upwards. Aeration of the sludge by the compressed gas causes an upward motion toward a riser. The collecting gutters direct the sludge toward the riser, which in turn channels the aerated sludge into disposal gutters located above the surface of the liquid. Slude is removed from the tank via the disposal gutters. This sludge aeration and removal process is effective for the cleaning of petroleum refinery oil separation tanks, as well as for settling tanks used in waste water treatment plants. (Lisk-FIRL)
W78-06650

KINETICS FOR ACTIVATED SLUDGE PROCESS DESIGN: EXPERIMENTAL APPLICATION TO STRAW PAPER WASTEWATER TREATMENT,
Genoa Univ. (Italy). Tecnologie dell Ingegneria Chimica.
M. Del Borghi, G. Migliorini, G. Isola, and G. Ferraiolo.
Biotechnology and Engineering, Vol. 20, No. 2, p 203-215, 1978. 11 fig, 2 tab, 20 ref.

Descriptors: *Activated sludge, *Pulp and paper industry, *Pulp wastes, *Kinetics, *Mathematical models, Biodegradation, Analytical techniques, Biochemical oxygen demand, Chemical oxygen demand, Waste water treatment, Industrial wastes.

Kinetic models were developed for batch and continuous feed process in activated sludge treatment of straw paper waste water. The sample waste water, containing multicomponent substrates with varying biodegradation rates, had BOD loads ranging 630-1380 mg/liter and COD loads of 1500-2900 mg/liter. Activated sludge treatment of the waste

samples in batch tests produced significant initial reduction in BOD and COD. Reduction rates decreased as the relative pollutant concentrations decreased. The reduction of BOD and COD was found to be directly dependent upon the initial concentration of the waste; the results of the batch tests could be expressed as a substrate kinetics equation. Similar activated sludge treatment of the straw paper wastes was evaluated with continuous tests. The liquor concentration in continuous tests reached a steady state concentrattion which was dependent upon the retention time in the reactor. The rate of substrate biodegradation was found to be higher in continuous tests than in batch tests. Kinetic models of continuous and batch tests became coincident only for high residence times when the reaction rate was controlled by complex substrates. The kinetic model for continuous test substrate removal accurately simulated continuous reactor results, whereas the kinetic model for batch tests dictated an aeration unit that was larger than necessary because of the model's prediction of a slow reaction rate. (Lisk-FIRL)
W78-06651

THE ENSO-BIOX METHOD: A BIOLOGICAL TREATMENT USING SOFTWOOD BARK PRETREATED WITH NUTRIENTS AS A FILTER MEDIUM REMOVED 90% OF MALODOROUS SULPHUR COMPOUNDS IN MILL TESTS FOR PURIFYING KRAFT PULP MILL CONDENSATES,
Enso-Gutzeit Osakeyhtio, Imatra (Finland).
I. Vettenranta.
Pulp and Paper of Canada, Vol. 79, No. 1, p 53-55, January, 1978. 3 fig, 4 tab, 4 ref.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Sulfur compounds, *Softwood, *Biological treatment, Filters, Biodegradation, Sulfur bacteria, Pilot plants, Laboratory tests, Gases, Waste treatment, Air pollution, Odor, Industrial wastes.

Laboratory, pilot plant, and full scale tests were performed with the Enso-biox biofilter technique, developed by Enso-Gutzeit Research Center of Finland, for deodorizing Kraft mill effluents. Odorous sulfur compounds produced by sulfate pulping processes were removed from gases and condensates in a unit employing sulfur bacteria on softwood bark filters. Condensates from the pulping effluent trickled through softwood bark filters that had been treated with microorganism-sustaining nutrients. Upward aeration of the odorous gas through the filter medium occurred simultaneously with the downward trickling of the odor-bearing waste. After passing through the filter and condensate, the gas was passed into another chamber for filtration. Toxic sulfur compounds were removed in the filtration process by a strain of sulfur bacteria on the softwood bark that metabolized the toxic waste. Odorous sulfur compounds from the gases and condensates of pulping processes were reduced by 88-98% in the laboratory, pilot plant, and full scale tests of the biofilter. A 73-75% reduction of methanol and a 73-82% reductionof acetone was achieved by employing two liquid biofilters in series. (Lisk-FIRL)
W78-06652

BACTERIOLOGY AND ENZYMOLOGY OF FELLMONGERY ACTIVATED SLUDGE SYSTEMS,
Rhodes Univ., Grahamstown (South Africa). Leather Industries Research Inst.
D. E. Rawlings, and D. R. Woods.
Journal of Applied Bacteriology, Vol 44, No 1, p 131-139, 1978. 3 fig, 5 tab, 25 ref.

Descriptors: *Activated sludge, *Tannery wastes, *Pseudomonas, *Enzymes, *Bacteria, Lipids, Proteins, Biodegradation, Aerobic bacteria, Biological treatment, Waste water treatment, Industrial wastes.

A quantitative analysis of activated sludge treated fellmongery wastes included studies on enzyme activity and enzyme-producing bacteria. Composite samples of waste water from sheepskin soaking and washing, as well as from the lime-sulfide unhairing operation, were obtained from a fellmongery in Port Elizabeth, South Africa. The fellmongery effluent contained sulfide, bisulfide, calcium ions, dissolved albumin, mucoids, mucopolysaccharides, keratin, dissolved and emulsified fats, and soluble and insoluble organic and inorganic compounds. Significant increases in bacterial and saprophytic protozoan counts with increases in catalase, protease, and phosphates activity indicated that these protozoa played an important role in the oxidation and hydrolytic changes during effluent treatment. The absence of keratinase activity was attributed to the absence of keratinase-producing bacteria. Bacteria colonies in the fellmongery activated sludge predominantly degraded proteins and lipids rather than detergents, nucleic acids, starches and cellulose. The bacterial balance of the fellmongery effluent was dominated by a relationship between pseudomonas and Acinetobacter. (Lisk-FIRL)
W78-06654

THE TREATMENT OF TANNERY EFFLUENTS WITH FLOCCULANTS,
Barrie Tanning Ltd., (Ontario).
S. A. Shivas.
Journal of the American Leather Chemist's Association, Vol 73, No 2, p 70-76, 1978. 3 tab, 4 ref.

Descriptors: *Tannery wastes, *Flocculation, *Polyelectrolytes, *Alum, *Chemical precipitation, Coagulation, Zeta potential, Colloids, Dewatering, Sludge treatment, Waste water treatment, Industrial wastes.

Flocculation of waste streams from tannery processes with alum, acid, and polyelectrolytes was evaluated. Brine washes and alkali soaks, containing high salt concentrations, soaps and emulsifiers, were successfully flocculated with alum. Suspended solids were reduced by 88% in the brine wastes and 60% in the alkali soak. Bate liquors could be treated with alum when large quantities of degreasing agents were present or with 6 ppm of a cationic polyelectrolyte for an 87% suspended solids removal. Flocculation of hair-pulp electrolyte for an 87% suspended solids removal. Flocculation of hair-pulp sol with anionic polyelectrolytes was highly successful when sulfides were removed before treatment and phosphate was added. An 88% removal rate was achieved for flocculation with an electrolyte; more effective flocculation was achieved with the more costly sulfuric acid treatment. The remaining tannery effluent streams, consisting of retan, dye, and fatliquor wastes, were effectively treated with 1-2 ppm of an anionic polyelectrolyte having a high molecular weight and charge density. A 75% removal rate was realized for polyelectrolyte flocculation of these combined waste streams. The addition of 20-60 ppm of a cationic polyelectrolyte to fresh sludge increased its dewaterability. (Lisk-FIRL)
W78-06655

TREATING AQUEOUS EFFLUENT CONTAINING ALBUMIN, ESPECIALLY GELATIN--BY ADDING BASIC POLYMERIC COMPOUNDS AND SEPARATING AGGLOMERATE.
Belgian Patent BE-856-361. Issued January 2, 1978. Derwent Belgian Patents Abstracts, Vol A, No 2, p 3, February, 1978.

Descriptors: *Food processing industry, *Polymers, *Electrolysis, *Nitrogen compounds, *Patents, Ureas, Ammonium compounds, Cathodes, Anodes, Waste water treatment, Industrial wastes.

A process for the treatment of albumin-bearing effluent with a basic polymeric compound to form a removable agglomerate has been patented. The process was developed for the treatment of effluent from the manufacture of gelatin and photographic products, and from the brewing, malting, leather tanning, and slaughterhouse industries. The polymeric compounds used in the process are basic water-soluble aminoplasts synthesized from a formaldehyde-dicyanodiamide condensate, formed optionally with urea, an alkalenepolyamine, and ammonium chloride. The treatment process also requires a polymeric compound formed from formaldehyde, dicyanodiamide, ammonium chloride, and ethylene diamine. A polyamide or polyamine, with an amine value of 200-650 mg KOG/gm, formed from a polymeric fatty acid and a polyamide is also recommended as a treatment polymer. The treatment process involves the addition of 3-6 g of the polymeric compound per liter of waste water at pH 6-9. Electrolytic treatment of the effluent with an aluminum alloy anode and an iron, copper, nickel, or stainless steel cathode is also recommended. (Lisk-FIRL)
W78-06656

THE DEVELOPMENT OF CANE WASH WATER TREATMENT SYSTEMS IN HAWAII,
Door-Oliver, Inc., Honokaa (Hawaii). Sugar Div.
L. Engel.
Sugar y Azucar, Vol 73, No 1, p 28, 30-31, 34-35, 1978. 2 fig, 3 ref.

Descriptors: *Food processing industry, *Sugarcane, *Sugar crops, *Filtration, *Polymers, Flocculation, Lime, Screens, Filters, Suspended load, Waste water treatment, Pilot plants, Industrial wastes, Hawaii.

Door-Oliver waste water treatment equipment was evaluated for sugarcane wash effluent in pilot plant tests. About 4.5 mgd of wash water was required for the daily cane harvest of 4,373 tons, of which 31% was soil and waste matter. The addition of a polymer or lime to the waste water was required for flocculation of soil particles before clarification. The addition of an anionic or nonionic polymer, considered more cost-effective than lime treatment, produced efficient settling at doses of 1 ppm. Filtration with cloth media was found to be inefficient and uneconomical. Perforated stainless steel screens provided higher filtration rates, thick sludge cakes, and freedom from plugging. The disadvantage of the stainless steel screens was the production of a high turbidity filtrate which had to be returned to the clarifier for suspended solids removal. Two diaphragm pumps transferred the clarifier underflow to the filtration operation. Liquid cyclone separators replaced stainless steel screens which were inadequate because of abrasion and clogging by material being pretreated. (Lisk-FIRL)
W78-06657

SOME ASPECTS OF WATER AND EFFLUENT MANAGEMENT IN THE IRON AND STEEL INDUSTRY,
South African Iron and Steel Corp. (Johannesburg).
J. J. C. Heynike.
Water Pollution Control, Vol 77, No 1, p 56-60, 1978. 4 tab, 1 ref.

Descriptors: *Steel, *Iron, *Water reuse, *Metals, *Air pollution, Evaporation, Sulfur compounds, Acids, Steam, Biological treatment, Biochemical oxygen demand, Waste water treatment, Industrial wastes.

Improvements in iron and steel industry treatment facilities for waste removal and water reuse are reviewed. The Iscor steel mill in Vanderbijlpark, South Africa, loses about 30% of the daily 63,000 cu m of intake water through evaporation. Water treatment for reuse in steel processing in the South African plant is based on the counter-current rinse system or cascade system in conjunction with acid

regeneration. A comparison of hydrochloric acid and sulfuric acid as pickling agents for steel production is presented; the vacuum cooling-crystallization process for acid recovery is preferred. Other processing and treatment methods providing water conservation are air cooling, basic oxygen furnaces, and evaporative cooling. Air cooling, requiring treatment of the waste water with sulfite and a dispersant, is preferred over the open wet cooling systems. Basic oxygen furnaces employ air coolers in a closed circulation system and venturi gas scrubbers and clarifiers in a closed system. Thermal energy recovery from steam produced during evaporative cooling is not as cost-effective as blast furnace evaporative cooling. Heat absorbing cooling water is separated into steam and water in the blast furnace process. The steam may be condensed in air-cooled heat exchangers for thermal recovery. Biological treatment of coke oven wastes is the most effective method for producing an acceptable effluent. Although ammonia is not ionized, BOD is reduced by 90%, phenol by 99%, and thiocyanate by 85-90%. A dephenolization process involving gravel filtration and solvent extraction is described. (Lisk-FIRL)
W78-06658

SEDIMENTATION APPARATUS WITH FLOCCULATING FEED WELL,
Dorr-Oliver Inc., Stamford, CT. (Assignee).
H. H. Oltmann.
U.S. Patent No. 4,054,514, 9 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 963, No 3, p 991-992, October 18, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water quality control, Industrial wastes, Water purification, Flocculation, Sedimentation, Equipment.

This invention relates to sedimentation apparatus for the continuous clarification of liquids or waste streams carrying suspended solids which require treatment with suitable flocculating agents so that these solids are caused to form settleable flocs. A rotary sludge raking structure and its drive mechanism are supported by a bridge or super structure spanning the tank, with the vertical shaft of the rake structure extending downward through the feed well cylinder. Rotation of the rake structure moves the sludge over the tank bottom to a sludge outlet in the center for withdrawal. The flocculated feed suspension entering the clarifier tank through a feed well at the center normally spreads out radially in all directions, allowing separated liquid from other liquor to overflow. The flocculated material settles to a sludge bed on the tank bottom where it may be withdrawn at a suitable rate. (Sinha-OEIS)
W78-06661

CHROME REMOVAL AND RECOVERY,
Cunningham (John), Portsmouth, OH. (Assignee).
E. J. Feltz, and R. Cunningham.
U.S. Patent No. 4,054,517, 6 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 963, No 3, p 992-993, October 18, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Chemical wastes, Water pollution treatment, Chromium, Chemical reactions, Chrome plating industry, Metal recovery, Backwash.

A process for removing and optionally recovering hexavalent chromium from chromium waste water is described. The invention involves the use of a treatment mixture comprising the combination of barium carbonate and/or barium hydrate, plus one or more certain specified acetates. The process involves contacting the chrome waste water to be treated with the treatment mixture at an acetic pH not exceeding 6.0, and usually from 4.0 to 6.0, followed by filtration through an acid-resistant filter. The chromium removed by this filter in the form of barium chromate can be regenerated into chromic acid by backwashing the filter into an agitated tank and treating to produce chromic acid and barium sulfate. The thus-generated chromic acid can then be returned to the chrome plating tank for reuse after passing through a filter to remove the barium sulfate. (Sinha-OEIS)
W78-06663

APPARATUS AND METHODS FOR SANITIZING SEWAGE EFFLUENT AND COMPOSITIONS FOR USE THEREIN,
L. P. Gould.
U.S. Patent No. 4,054,518, 6 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 963, No 3, p 993, October 18, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Sewage effluent, Water pollution treatment, Environmental sanitation, Bactericides, Equipment.

An apparatus and method to treat sewage effluent comprises a rack fabricated of a material impervious to both sewage effluent and a chlorine releasing bactericidal agent, preferably fabricated of plastic containing tablets of trichloroisocyanuric acid. the rack is seated within a conduit for the flow of sewage. The tablets are positioned in a row generally along the direction of effluent flow. The tablets extend generally transversely across a substantial portion of the conduit so that the greater the depth of effluent in the conduit, the greater the surface area of tablets exposed. The number of tablets employed in a row is a function of the demand for bactericidal agent which must be satisfied. In periods of relatively high effluent flow rate, the tablets may be nearly or completely submerged thereby dissolving at a maximum rate. However, at low flow periods only a small portion of the tablet would be exposed and a correspondingly low rate of dissolution experienced. The bactericidal agent is trichlorosiocyanuric acid which, in the presence of water, forms hypochlorite solution leaving cyanuric acid which is tasteless, odorless, colorless and non-toxic. (Sinha-OEIS)
W78-06664

APPARATUS FOR PURIFYING WASTE WATER CONTAINING ORGANIC CONTAMINANTS,
Agrotechnika, narodny podnik, Zvolen (Czechoslovakia). (Assignee).
S. Mackrie, V. Mackrie, and O. Dracka.
U.S. Patent No. 4,054,524, 9 p, 8 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 963, No 3, p 995, October 18, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water purification, Organic wastes, Aeration, Denitrification, Equipment.

A cylindrical reaction chamber for purifying waste water has a separating zone extending along its entire length and bounded transversely by first and second downward converging partition walls. The space in the vessel between the vessel wall and the first and second walls form separate waste water activation zones, in at least one contains an aerating device. Such zones are so configured that separate, oppositely directed transverse swirls of the waste water are established in the respective activating zones. A portion of the agitated water, after suitable treatment by baffle plats to remove the transverse swirling component, is introduced into the bottom of the separating zone for purification via fluid filtration. A pair of guide channels extend obliquely downward adjacent both ends of the separating zone, thereby providing a longitudinal circulation of waste water which promotes denitrification of certain contaminants in the waste water in the absence of aeration of the second activation zone. (Sinha-OEIS)
W78-06666

TRANSFORMATION OF ORGANOTIN COMPOUNDS IN WATER, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Inst. (I) (USSR). Dept. of Public Hygiene.
V. T. Mazaev, O. V. Golovanov, A. S. Igumnov, and V. N. Tsai.
Gig Sanit 3, p 17-20, 1976.

Descriptors: *Organotin compounds, Tin, Biological treatment, Ultraviolet radiation, Waste water treatment, Organic wastes, *Alkylation(Tin), *Hydrolysis, Microorganisms.

Hydrolysis was the determined factor of destruction of organic Sn compounds in water. Biochemical processes (due to microorganisms) affected only trialkyl compounds present at concentrations causing no biocidal action. UV radiation affected the stability of the Sn organic compounds. Stability depended on the extent of their alkylation and the form of alkyl.--Copyright 1978, Biological Abstracts, Inc.
W78-06671

THICKENING DEVICE AND METHOD,
Envirotech Corp., Menlo Park, CA. (Assignee).
R. C. Emmett, Jr.
U.S. Patent No. 4,055,494, 7 p, 3 fig, 21 ref; Official Gazette of the United States Patent Office, Vol 963, No 4, p 1324, October 25, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Flocculation, Suspended solids, Sedimentation, Water purification, Pulp and paper industry.

A primary object of the invention is to provide by gravity separation, an improved sedimentation machine for treating mineral slurries, industrial wastes and sewage, and the like, where the sedimentation device has the capacity to handle high flow rates of influent liquor per unit volume of the liquid-holding tank while still providing good clarity in the supernatant liquid. Slurries of finely divided solids which the sediment machine of the invention is intended to treat include, ore slurries, pulp and paper recausticizing slurries, flue gas scrubbing slurries, coal refuse slurries, and municipal and industrial wastewaters. The machine includes a liquid-holding tank having an upstanding tubular column mounted for receiving the feed liquor. An inlet is formed in the upper portion of the column to admit clarified supernatant into the column for mixing with, and dilution of, the feed liquor. Several adjacent compartments include reagent introduction and mixing to receive the feed liquor and to mix a chemical flocculating reagent. At the bottom of the column is an outlet to discharge the floculated liquor directly into a pulp blanket stratum established within the tank. (Sinha-OEIS)
W78-06673

METHOD FOR PREPARING AQUEOUS, RADIOACTIVE WASTE SOLUTIONS FROM NUCLEAR PLANTS FOR SOLIDIFICATION,
Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany). (Assignee).
H. Schmieder, and R. Kroebel.
U.S. Patent No. 4,056,482, 5 p, 6 ref; Official Gazette of the United States Patent Office, Vol 964, No 1, p 217, November 1, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Radioactive wastes, *Nuclear wastes, *Electrolysis, Cathodes, Anodes, Oxidation, Reduction(Chemical).

A method is provided for preparing aqueous, radioactive waste solutions, from reprocessing plants for spent nuclear fuel and/or breeder materials and other nuclear plants, for noncontaminating solidification and/or removal of such solutions. The total quantity of the various inorganic and organic substances in the waste solution is reduced by the destruction of nitric acid,

nitrates and nitrites and the formation of a waste gas mixture which is practically free of higher nitrous oxides. To bring this about, the radioactive waste solution are subjected to an electrolysis current at such current densities at the anode and at the cathode that in one process step the substances of the group hydrazine, hydroxylamine, oxalic acid, oxalates, tartaric acid and tartrates are oxidized at the anode and the substances of the group nitric acid, nitrates and nitrites are reduced at the cathode. (Sinha-OEIS)
W78-06678

CATALYTIC DEODORIZING SYSTEM FOR HUMAN MANURE GAS, (SHOKUBAI SANKA NI YORU SHINYO GASU NO DASSHU SHISUTEMU),
H. Watake, and T. Horikawa.
Toshiba Rebyu, (Toshiba Review), Vol. 32, No. 10, p 824-824, 1977. 7 fig, 1 tab, 3 ref.

Descriptors: *Odor, *Oxidation, *Catalysts, *Waste reatment, *Hydrogen sulfide, Air environment, Municipal wastes, Treatment facilities, Sewage treatment, Waste water treatment.

High concentrations of hydrogen sulfide in sewage gas have generally required pretreatment before contact with a catalytic oxidation system. A system developed by the Toshiba Company of Japan eliminates the need for pretreatment of sewage gas before deodorizing by catalytic oxidation. A corrugated honeycomb catalyst is used in the Toshiba deodorizing system. The new system is operated at higher than usual temperatures and can effectively reduce the high concentrations of hydrogen sulfide in the sewage gas without deleterious effects on the catalyst. The Toshiba deodorizing system has been installed at Amagasaki City in Japan. (Lisk-FIRL)
W78-06698

BIODEGRADATION OF ORGANIC SUBSTANCES BY BIOLOGICAL TREATMENT AND IN NATURAL WATERS (GESUIDO SHORI JO OYOBI KOKYOYO SUIIKI NI OKERU YUKIODOKU BUSSHITSU NO BUNKAI KATEI NI KANSURU KENKYU),
K. Murakami, K. Hasegawa, H. Watanabe, and K. Komori.
Showa 51 Nendo Kankyo Hozen Kenkyu Seika Shu II, (A Collection of Results on the 1976 Environmental Conservation Researcher), Vol. 1, No. 95, p 1-17, 1977. 24 fig, 8 tab, 3 ref.

Descriptors: *Biochemical oxygen demand, *Chemical oxygen demand, *Carbon, *Organic matter, *Biodegradation, Analytical techniques, Aerobic conditions, Chromatography, Algae, Chlorophyta, Cyanophyta, Waste water treatment, Municipal wastes.

Organic components which are resistant to waste treatment were identified and their properties investigated. Samples of secondary sewage effluent and receiving waters were exposed to aerobic, dark conditions at 20C. It was found that the rate coefficient of decay by first-order reaction was greater for short-term decomposition of BOD than for COD due to manganese and total organic carbon. The decomposition rate for total organic carbon was greater than that of COD under the preceeding conditions, but both were approximately more accurately with longer decomposition periods and higher-order reactions. Using gel filtration chromatography, soluble organic compounds were categorized into two groups of biodegradable substances and two groups of nondegradable substances. Gel chromatographs were similar for polluted receiving water and secondary effluent and showed that the order of removal of compounds for size separation by gel filtration chromatography was based not on molecular weight, but on molecular structure and functional group. Aerobic decomposition of freshwater green and blue-green algae in lake water occurred within ten days during summer. The activated sludge process was effective in removing contributors to TOC which did not exhibit much ultraviolet absorbence at 260 nm. (Lisk-FIRL)
W78-06700

5E. Ultimate Disposal Of Wastes

SURVIVAL AND MOVEMENT OF FECAL INDICATOR BACTERIA IN SOIL UNDER CONDITIONS OF SATURATED FLOW,
Oregon State Univ., Corvallis. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W78-06224

THE USE OF REMOTE SENSING TECHNIQUES FOR DETECTION AND IDENTIFICATION OF POLLUTANT DISCHARGES,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 5A.
W78-06230

NEARSHORE DISPOSAL: ONSHORE SEDIMENT TRANSPORT,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 5B.
W78-06243

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX A--MAIN SHIP CHANNEL (SAN FRANCISCO BAR).
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5C.
W78-06253

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX C--WATER COLUMN.
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5B.
W78-06254

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX D--BIOLOGICAL COMMUNITY,
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5C.
W78-06255

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY, APPENDIX F--CRYSTALLINE MATRIX,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W78-06256

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX I--POLLUTANT AVAILABILITY,
California Univ., Berkeley. Lawrence Berkeley Lab.; California Univ., Berkeley. Div. of Energy and Environmental; and California Univ., Bodega Bay. Inst. of Pollution Ecology.
For primary bibliographic entry see Field 5B.
W78-06257

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX J--LAND DISPOSAL,
International Engineering Co., Inc., San Francisco, CA.
R. Samuelson.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-038 313, Price codes: A18 in paper copy, A01 in microfiche. Army Corps of Engineers, San Francisco, California, Engineer District, October 1974. 378 p, 5 fig, 17 tab, 24 plates, 6 append. DACW-7-73-C-0079.

Descriptors: *Landfills, *Waste disposal, Dredging, *California, Estuarine environment, Pollution abatement, Economics, Dredge disposal, *San Francisco Bay(CA).

The evaluation of the economic, technical and environmental feasibility of land disposal of dredged material from San Francisco Bay is evaluated. An economic comparison model of various dredging methods and transport modes for different combinations of alternative land and water disposal systems is developed. Studies included costing of dredging equipment and transport modes; mapping potential land sites around the Bay; and evaluating sites in terms of the physical properties of the sediments, site operation and site constraints. (Sinha-OEIS)
W78-06258

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX M--DREDGING TECHNOLOGY.
JBF Scientific Corp., Wilmington, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-038 315, Price codes: A17 in paper copy, A01 in microfiche. Army Corps of Engineers, San Francisco, California, Engineer District, September 1975. 380 p, 122 fig, 32 tab, 3 append. DACW 07-75-C-0045.

Descriptors: *Waste disposal, *Dredging, *Estuaries, *Estuarine environment, Pollution abatement, Water pollution sources, Baseline studies, Resources development, *California, *Dredging disposal, *Dredging technology, *San Francisco Bay(CA), Marsh development, Ocean dumping, Environmental protection.

A study was conducted to investigate dredging technology and to advance the state of knowledge regarding the short-term fate of dredged materials dumped from barges or hopper dredges. Particular attention was given to application of the study findings to protection of the aquatic environment in the San Francisco Bay Area. Field tests evaluated physical and chemical properties of dredged materials in many conditions. Parameters observed in characterizing the data included descent velocity, cloud size, impact velocity, horizontal velocity following impact, and settling patterns. Moisture content appeared to be the primary variable determining behavior of dumped materials. Engineering aspects of intertidal disposal for the purpose of marsh creation were evaluated. Other considerations in marsh building were discussed, including tidal inlet design, means of excavating in marsh areas, and movement of salt through dredged material. Certain aspects of land disposal were investigated with reference to conditions in the San Francisco Bay Area. Treatment processes for removing contaminants and for hastening drying were discussed and evaluated. Productive uses of dredged material were also considered. (Sinha-OEIS)
W78-06259

INVESTIGATING WASTE OIL DISPOSAL BY DIRECT INCINERATION,
Army Mobility Equipment Research and Development Center, Fort Belvoir, VA. Petroleum and Materials Dept.
M. E. LePera, and G. DeBono.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-011 236, Price codes: A02 in paper copy, A01 in microfiche. Report No 2127, February 1975. 20 p, 1 fig, 8 tab, 7 ref, 1 append. IT662611AH69.

Descriptors: *Incineration, *Oil wastes, Fuels, *Waste disposal, *Air pollution, *Particulate emissions, Waste oil, Fuel oil, *Waste oil disposal, *Fuel oil disposal, Emission rates, Aberdeen Proving Ground(MD).

A combustion-emission test program, conducted at Aberdeen Proving Ground in Maryland evaluated the feasibility of disposal of waste oil products by direct incineration. It was indicated that most waste oils can be incinerated as fuel-oil-blending components without attendant stack emission problems. A 'referee' or 'wort case' 20% waste oil/fuel oil blend, composed primarily of automotive crankcase drains blended into No. 2 Fuel Oil, was combusted in a burner-boiler powerplant utilizing a rotary-cup atomizer. During this steady-state combustion of 'heavy waste oil' stack emissions were monitored by the Army Environmental Hygiene Agency to define the effects of the waste oil fraction on the particulate emission rates. The use of 20% waste oil/fuel oil blend in the burner system produced emission rates which could be in violation, depending on whether the particular blend is defined as a residual or distillate product. High particulate emissions were in part attributable to the inefficient operation of the rotary-cup atomizers employed in the burner system, which can significantly affect and/or alter the emissions produced from the same mixture. Other burner systems employing the steam-assist atomizers would produce substantially lower particulate emissions. Basically particulate emissions increased significantly with the addition of the waste oil component; waste oil stratification could also present a problem. Additional tests are mandated to quantify the relationships between particulate emission rates, boiler-configuration and endurance, and long-term operation on waste oil/fuel oil blends to identify potential burner nozzle and heat-transfer-surface problems. (Seip-IPA)
W78-06261

GAS AND LEACHATE FROM LANDFILLS: FORMATION, COLLECTION, AND TREATMENT,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
For primary bibliographic entry see Field 5B.
W78-06263

DRAFT ENVIRONMENTAL IMPACT STATEMENT - CHEMICAL WASTE INCINERATOR SHIP PROJECT (VOLUME 1 OF 2 - ENVIRONMENTAL ANALYSIS AND APPENDICES I, II, AND III, U.S. ENVIRONMENTAL PROTECTION AGENCY: DISPOSAL OF ORGANOCHLORINE WASTES BY INCINERATION AT SEA).
Maritime Administration, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 727, Price codes: A11 in paper copy, A01 in microfiche. Report No MA-EIS-7302-76-08D, July, 1975, 224 p. 3 fig, 6 tab, 31 ref, 3 append.

Descriptors: *Incineration, Chemical wastes, Environmental effects, Waste disposal, Ultimate disposal, Hazards, Analytical techniques, Safety, *Chemical Waste Incinerator Ship Project, Ocean incineration, Organochlorine wastes, Marine protection, Research and Sanctuaries Act, Public Law 92-532.

The potential for safe disposal of toxic chemical wastes by incineration at sea was investigated by the Chemical Waste Incinerator Ship Project; environmental impact was assessed for both fresh water and marine ecosystems. A limited adverse effect on the local environment of U.S. shipyards would result from the construction/conversion, operation, maintenance, repair, and scrapping of the vessels to be built under the Project. Once the vessels become operational, there would exist a potential hazard to the marine environment from the accidental release of harmful substances due to casualties and mishaps; the extent and impact of such spills depends on the degree of pollution, type of pollutant spilled, spill location, duration of spill, and physical conditions under which the spill occurs. The high temperature combustion in the open ocean of toxic chemical wastes, under strictly observed safety regulations, has minimal adverse impact on the marine environment. For chlorinated hydrocarbons, conversion is principally to water vapor, CO2, and HCl; combustion efficiencies are in excess of 99.9%. Safety and control measures and alternative methods of disposal are described. Three appendices contain lists of noxious and other liquid substances carried in bulk by water, hazard ratings of chemical shipped in bulk by water, and hazardous waste stream constituents for which incineration is considered an acceptable waste treatment alternative. Appendix IV (Volume 2) presents a detailed analysis of the environmental impact of sea incineration of organochlorine wastes produced by Shell Chemical Company. (See also W78-06266) (Seip-IPA)
W78-06265

DRAFT ENVIRONMENTAL IMPACT STATEMENT - CHEMICAL WASTE INCINERATOR SHIP PROJECT (VOLUME 2 OF 2 - APPENDIX IV, U.S. ENVIRONMENTAL PROTECTION AGENCY: DISPOSAL OF ORGANOCHLORINE WASTES BY INCINERATION AT SEA).
Maritime Administration, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 979, Price codes: A10 in paper copy, A01 in microfiche. Report No EPA - 430/9-75-014, July, 1975. 226 p, 11 fig, 15 tab, 16 ref, 6 append.

Descriptors: *Chlorides, *Incineration, *Chemical wastes, *Environmental effects, Waste disposal, Ultimate disposal, Gulf of Mexico, Oxidation, Analytical techniques, Chemical Wastes Incinerator Ship Project, *Organochlorine wastes, *Organochlorides, *Ocean incineration, M/T Volcanus, Marine Protection Research and Sanctuaries Act, Public Law 92-532.

Ocean incineration of organochlorine wastes (produced by the Shell Chemical Company's Deep Park, Texas plant) was investigated aboard the M/T Vulcanus in the Gulf of Mexico from October 1974 through January 1975, under an EPA-issued ocean dumping permit. A total of 16,800 metric tons of waste (primarily a mixture of chlorinated hydrocarbons with trichloropropane, trichloroethane, and dichloroethane) were incinerated at a maximum rate of 25 metric tons/hour with a 1200C minimum and a 1350C average flame temperature. Stack gas emissions were monitored for O, CO, CO2, Cl, HCl, unburned organochlorine compounds, plume dispersion and characteristics, and combustion efficiency. Results indicate that more than 99.9% of the wastes were oxidized; the resulting emissions consisted primarily of HCl, CO2, and H2O, and were discharged directly into the atmosphere without scrubbing. Studies monitoring the impact of emissions on the marine environment indicate that there were no measureable increases in concentrations of trace metals and organochlorides in the water and marine life; no adverse effects on migratory birds were noted. Ocean incineration of wastes, if conducted in accordance with the conditions of the EPA dumping permit, was found to be an effective and environmentally safe means of disposal of organochloride wastes. Recommendations for improvement of incinerator design and operation, monitoring techniques and equipment, and communications and navigation methods are outlined. Volume I contains an environmental analysis of waste disposal at sea and 3 appendices. (See also W78-06265) (Seip-IPA)
W78-06266

DISPERSION OF BUOYANT WASTE WATER DISCHARGED FROM OUTFALL DIFFUSERS OF FINITE LENGTH,
California Inst. of Tech., Pasadena.
For primary bibliographic entry see Field 5B.
W78-06269

AN ENVIRONMENTAL SURVEY OF EFFECTS OF DREDGING AND SPOIL DISPOSAL, NEW LONDON, CONNECTICUT: 4TH QUARTERLY REPORT.
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-06274

CARBON AND NITROGEN TRANSFORMATIONS IN SOILS AMENDED WITH SEWAGE SLUDGE,
Purdue Univ., Lafayette, IN.
R. E. Terry.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-15,484. PhD Thesis, 1976, 180 p.

Descriptors: *Carbon, *Nitrogen, *Sludge disposal, *Fertilizers, *Chemical reactions, Soils, Ammonia, Nitrogen compounds, Soil chemical properties, Soil physical properties, Sewage disposal, Waste water treatment.

The effects of soil characteristics, sludge management procedures, and environmental conditions on the decomposition rate of sludge in soils and on transformations in sludge-amended soils were investigated in laboratory experiments with synthetically-prepared sludges. Studies indicated that sludge decomposed rapidly during the first 28 days of incubation and slowly for the remainder of the incubation period. With synthetic sludges, 44% of the organic carbon was evolved s CO2 after 224 days of incubation as compared with 26-42% after 130 days for soil-applied municipal sludges. Although increased temperatures accelerated sludge decomposition, little effect was produced by soil pH, texture, and moisture content. Nitrification rates and the breakdown of native soil organic matter were increased in sludge-amended soils. Ammonia losses by volatilization in sludge-amended soils were greater in samples receiving multiple sludge applications and under conditions of high soil pH, rapid drying, and low clay content. Sludge addition resulted in higher concentrations of all nitrogen forms. (Schulz-FIRL)
W78-06282

MERCURY RECOVERY FROM CONTAMINATED WASTE WATER AND SLUDGES,
Georgia-Pacific Corp., Bellingham, WA. Bellingham Div.
For primary bibliographic entry see Field 5D.
W78-06286

MUNICIPAL SLUDGE MANAGEMENT: EPA CONSTRUCTION GRANTS PROGRAM. AN OVERVIEW OF THE SLUDGE MANAGEMENT SITUATION,
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W78-06290

TRENCH INCORPORATION OF SEWAGE SLUDGE IN MARGINAL AGRICULTURAL LAND,
Agricultural Research Service, Beltsville, MD. Biological Waste Management Lab.
For primary bibliographic entry see Field 5B.
W78-06297

PROCEEDINGS OF THE BIOCONVERSION ENERGY RESEARCH CONFERENCE HELD AT

MASSACHUSETTS UNIVERSITY, AMHERST ON 25r26 JUNE 1973.
National Science Foundation, Washington, DC. Research Applied to National Needs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-231 149, Price codes: A07 in paper copy, A01 in microfiche. Report No. NSF-RA-N-73-007, June 26, 1973. 120 p, 4 fig, 5 tab, 28 ref. GI 39215.

Descriptors: *Energy conversion, *Conferences, Anaerobic bacteria, Anaerobic conditions, Anaerobic digestion, Waste treatment, Fuels, Methane, Massachusetts, Fermentation, Resources, Industrial wastes, Management, Solar radiation, Model studies, Computer models, *Bioconversion, Amherst(MA), Resource recovery, Refuse, Fuel gases.

Summaries are provided of papers presented at the Bioconversion Energy Research Conference held June 25-26, 1973. The conference investigated the feasibility and applicability of anaerobic conversion of waste materials to methane gas; technical papers were presented and discussion sessions followed. The articles are titled: 'Methane Fermentation - Future Promise or Relic of the Past.' 'Terminal Anaerobic Dissimulation of Organic Molecules'; 'Resource Recovery from Municipal Solid Waste'; Anaerobic Processing of Organic Refuse'; 'Dynamic Modeling Control Strategies for the Anaerobic Digestion Process;' 'Methane Production from the Anaerobic Treatment of Petrochemical Industry Wastewaters'; 'Bioconversion Energy Studies at the University of California, Berkeley'; 'Thermophilic Anaerobic Digestion of Solid Waste'; 'Conversion of Solar Energy to Fuel Gas'; and 'Anaerobic Fermentation of Wastes'. A list of conference participants is provided. (Wares-IPA)
W78-06298

GUIDANCE REGARDING THE SETTING UP OF ENCAMPMENT HYGIENE AT A PERMANENT ENCAMPMENT AREA (OHJE LEIRIHYGIENIAN JARJESTELYSTA PYSYVILLA LEIRIALUEILLA),
Research Center of the Defence Forces, Helsinki (Finland).
For primary bibliographic entry see Field 5D.
W78-06300

STATUS REPORT ON COMPLIANCE WITH THE CHLOR-ALKALI MERCURY REGULATIONS - 1975.
Department of the Environment, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5G.
W78-06308

FATE AND BEHAVIOR OF SELECTED HEAVY METALS IN INCINERATED SEWAGE SLUDGE,
Rutgers - The State Univ., New Brunswick, NJ.
For primary bibliographic entry see Field 5A.
W78-06315

TRANSLOCATION AND ATTENUATION OF WASTEWATER PHOSPHORUS IN STREAMS,
Rensselaer Polytechnic Inst., Troy, NY.
For primary bibliographic entry see Field 5B.
W78-06320

ANNUAL REPORT, 1973, INSTITUTE FOR WASTE REMOVAL (SVA), THE NETHERLANDS.
Institute for Waste Removal (SVA), Amersfoort (Netherlands).
For primary bibliographic entry see Field 5D.
W78-06343

CLEANING COAL WITH COAL: COAL HUMIC ACIDS FOR REMOVAL OF ACIDS, ALKALI, SALINITY, AND HEAVY METAL POLLUTANTS ASSOCIATED WITH THE USE OF COAL AS A FUEL,
Missouri Univ.-Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5D.
W78-06347

MARINE POLLUTION: DIAGNOSIS AND TREATMENT, (MEERESVERSCHMUTZUNG: DIAGNOSE AND THERAPIE),
For primary bibliographic entry see Field 5G.
W78-06361

THE EFFECT OF SEEPAGE ON THE DESIGN OF STORM WATER PONDS IN FLORIDA,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-06369

CHLORIDES IN THE KRAFT RECOVERY SYSTEM,
Institutet for Vatten- Och Luftvardsforskning, Stockholm (Sweden).
For primary bibliographic entry see Field 5D.
W78-06374

VIRUS ADSORPTION BY FIVE SOILS,
Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5B.
W78-06422

ENVIRONMENTAL POLLUTION CONTROL IN METROPOLITAN ATHENS,
Environmental Pollution Control Project, Athens (Greece).
For primary bibliographic entry see Field 5G.
W78-06425

SEAWATER PLUS SEWAGE YIELDS LOTS OF THE FUEL GAS.
Machine Design, Vol 50, No 3, p 10, February, 1978.

Descriptors: *Hydrogen, *Igneous rocks, *Basalts, *Sea water, *Biomass, Sewage sludge, Steam, Methane, Drilling, Boreholes, Sludge disposal.

A technique for hydrogen gas production by reacting sea water with molten ferrous iron in subsurface magma has been developed by Sandia Laboratories of Albuquerque, New Mexico. It is estimated that 500 lb/hr of hydrogen gas would be produced by pumping 150,000 lb/hr of water into basaltic magma at a temperature of 1,200C. Hydrogen production in magma containing 2-12% ferrous iron can be increased by the addition of biomass to the water. Suggested sources of biomass are sewage sludge, waste byproducts from crop harvesting and processing, and seaweed. The cellulose of the plants releases its hydrogen during the reaction with the magma. The reaction of water containing 10% biomass with magma at 1,300C would yield gases containing 10% hydrogen. Reduction of the magma temperature at 600C would produce a higher methane gas content. An annual production rate of 26 billion cu ft of hydrogen is predicted for large basaltic magma chambers with a 12% ferrous iron content at 1,200C. Magma sources are thought to be located approximately 2-3 km below the ocean floor, within the range of current drilling technology. Steam, a byproduct of the process, can be used in electrical power generation. (Lisk-FIRL)
W78-06426

EXPERIMENT TO PRODUCE COMMERCIAL SOIL CONDITIONER FROM SEWAGE SLUDGE PROVES SUCCESSFUL.
Water and Pollution Control, Vol 116, No 2, p 22, January, 1978.

Descriptors: *Sewage sludge, *Fertilizers, *Biodegradation, *Crop response, *Soil amendments, Sludge treatment, Incineration, Growth rates, Canada, Waste water treatment, Treatment facilities, Waste water disposal, Municipal wastes.

A soil conditioner developed by Enrich Development Corporation of Delta, British Columbia, Canada, from sewage sludge produced by the Greater Vancouver Regional District's Iona Island waste treatment plant in Richmond is evaluated. The sludge is mixed with sawdust and composted in six- to eight-foot piles for two to three months. The stabilized, non-odorous composted sludge is then screened for the removal of large particles. Tests conducted with the soil fertilizer indicate increased plant growth and improved water retention by the soil. The soil conditioner, commercially marketed as 'Grow-Rich,' is suitable for use in agriculture, horticulture, landscaping, and lawn conditioning. Incineration of one dry ton of sludge by the waste treatment facilities costs about $100 while the cost of producing one dry ton of the fertilizer from sewage sludge is about $17. The Iona Island treatment plant produces about 370 cu yd/day of sludge. The market price of the soil conditioner is expected to be competitive with the price of truck-load top soil, which sells for $7-10/yd. (Lisk-FIRL)
W78-06458

ENVIRONMENT GETS TOP TREATMENT IN HAWAIIAN SEWAGE OUTFALL JOB.
For primary bibliographic entry see Field 5D.
W78-06465

DEEP SHAFT SYSTEM USES GRP.
For primary bibliographic entry see Field 5D.
W78-06481

TRUCK-TANKERS CLEAN SEPTIC TANKS IN RURAL AREAS,
For primary bibliographic entry see Field 5D.
W78-06488

LET THEM EAT SEWAGE DOWN AT THE FISH FARM.
New Scientist, Vol 77, No 1085, p 70, January, 1978.

Descriptors: *Fish farming, *Fish diets, *Proteins, *Feeds, *Sewage sludge, Worms, Sludge disposal, Livestock, Waste water treatment, Waste water disposal, Municipal wastes.

As estimated 1.4 million tons of dried sewage is disposed of each year in England, representing 1 million tons of primary treated effluent and 0.4 million tons secondary treated sewage. Primary effluent contains about 16% available protein; secondary sludge contains about 40% available protein. Sewage sludge is discussed as a possible source of food for the production of fish protein in fish farms. The supplemental feeding of sewage effluent to fish which are raised as a protein source for human consumption was suggested as an energy and food conserving measure. As an alternative to the direct feeding of sewage sludge to fish, it was suggested that feed worms and fly larvae be reared on the solid wastes. A food chain system such as this could produce an estimated 30 tons of fish/50 of tons sewage sludge. Although human consumption of the sewage-fed fish may not be acceptable, the fish could be marketable as fish meal in animal feeds. (Lisk-FIRL)
W78-06495

PROCESS SYNTHESIS AND INNOVATION IN FLUE GAS DESULFURIZATION,
California Univ., Berkeley.
For primary bibliographic entry see Field 5D.
W78-06519

TREATMENT OF EFFLUENT,
For primary bibliographic entry see Field 5D.
W78-06621

SEWAGE SLUDGE DISPOSAL,
Thiokol Corp., Newton, PA. (Assignee).
W. F. Wagner.
United States Patent 4,073,242. Issued February 14, 1978. Official Gazette of the United States Patent Office, Vol 967, No 2, p 454, February, 1978. 1 fig.

Descriptors: *Sludge disposal, *Incineration, *Dewatering, *Patents, *Design data, Pressure conduits, Sludge dewatering, Pipes, Flow control, Waste water treatment, Municipal wastes.

A patent has been issued for a sludge disposal system in which dewatered sludge is incinerated in small, regulated amounts. The effluent is passed through a sieve for liquid-solids separation; the sludge is pulverized. The dewatered and ground sludge, with a uniform density and consistency maintained by agitation, is pumped at a high velocity from the sludge collection tank through a pipe back into the collection tank. The velocity of the agitated sludge in the pipe is great enough to prevent clogging. Small amounts of sludge are occassionally diverted to a second pipe at the same velocity but a smaller volumetric flow. Sludge in the second pipe is conveyed to an incinerator where compressed air sprays the sludge into the combustion chamber. The volume of sludge sprayed into the incinerator is less than the volume of sludge flowing through the first pipe. The smaller volume of sludge that is periodically combusted allows for a smaller incineration unit than would be necessary were the entire volume of sludge in the first pipe incinerated. (Lisk-FIRL)
W78-06626

PROCESSING OF PAPER MILL EFFLUENT TREATMENT SLUDGES (ZPRACOVANI ODPADNICH KALU Z CISTENI PAPIRENSKYCH ODPADNICH VOD),
IRAPA, Prague (Czechoslovakia). Vyvojovy a Racionalizacni.
J. Kirchnerova.
Papir a Celuloza, Vol. 32, No. 7-8, p 202-204, 1977. 1 fig, 3 ref.

Descriptors: *Sludge treatment, *Pulp wastes, *Dewatering, *Sludge disposal, Wastes, Industrial wastes, Pulp and paper industry, Solid wastes, Suspended solids, Filters, Centrifugation, Wood wastes, Burning, Sludge, Soil disposal field, Waste treatment, Equipment, Landfills, Feeds, Soil conditioners, Building materials.

From 2 to 6% of the production of paper or paperboard leaves the mill with waste water in the form of suspended solids. These solids are separated in the mechanical treatment plant as waste sludge. A typical paper mill sludge contains mainly fines and inorganic fillers. Dewatering of waste sludges can be done on sludge fields or using frame presses, vacuum filters, belt presses, centrifuges, etc. Recent attention has been paid to belt presses with two convergent screens. Among the listed manufacturers of such presses are Andritz (Austria), Bellmer, Prefiltex, and Klein (West Germany). The disposal on a landfill is common, but highly dewatered sludges or those mixed with wood wastes can also be burned. Attempts to utilize sludge for the production of paperboard, fodder material, building materials, and as soil conditioner are noted. (Trubacek-IPC)
W78-06629

PAPER MILL SLUDGE DEWATERING IN THE JINDRICHOV MILL (ZAHUSTOVANI PAPIRENSKYCH KALU V ZAVODE JINDRICHOV),
Olsanske Papirny (Czechoslovakia).
M. Vymetal.
Papir a Celuloza, Vol. 32, No. 7-8, p 218-219, 222, 1977. 2 fig, 5 ref.

Descriptors: *Sludge treatment, *Pulp wastes, *Dewatering, Wastes, Industrial wastes, Solid wastes, Pulp and paper industry, Foreign countries, Europe, Centrifugation, Operating costs, Capital costs, Costs, Sludge, Polyelectrolytes, Cations, Equipment, Czechoslovakia.

The Jindrichov paper mill (Czechoslovakia) effluent is treated in three Dorr-Oliver clarifiers. The sludge contains 40-50% inorganic fillers. The organic part includes mainly fines and fiber fragments. To dewater the sludge, a centrifuge, Wangner filter, or SEM dewatering press manufactured by the Andritz Co. (Austria) could be used. The SEM press was selected because of the relatively highest dewatering efficiency and lowest operating and capital costs. Currently about 470 cu m/hr of paper mill effluent are clarified, and the resulting sludge at a consistency of 1.8% is pumped to the SEM press. The dewatered sludge with a consistency of 35% amounts to 160 kg/hr (dry weight). Percol 140 cationic polyelectrolyte is added (0.93 g/kg) as a sludge conditioner. (Trubacek-IPC)
W78-06631

EFFLUENT TREATMENT PLANT SLUDGE MANAGEMENT IN THE PAPER MILL AT VRANE ON THE VLTAVA RIVER (KALOVE HOSPODARSTVI CISTIRNY ODPADNICH VOD V ZAVODE VRANE NA VLTAVOU),
Zapadoceske Papirny (Czechoslovakia).
V. Setelik, and V. Mlejnska.
Papir a Celuloza, Vol 32, No 7-8, p 223-224, 228, 1977. 4 tab.

Descriptors: *Sludge treatment, *Pulp wastes, *Dewatering, Wastes, Industrial wastes, Solid wastes, Waste treatment, Pulp and paper industry, Foreign countries, Europe, Filters, Centrifugation, Costs, Energy, Operating costs, Equipment, Sludge, Filters, Czechoslovakia, Vltava River(Czechoslovakia).

Effluent treatment sludge from the production of groundwood-free nonsized papers from a highly refined furnish was found difficult to dewater on a vacuum filter, even with the addition of sawdust. A continuous centrifuge and the SEM Andritz press were considered as a replacement for the filter. Both the centrifuge and the press were found to be substantially better than the filter. In spite of the relatively high polycoagulant cost and high energy usage, the centrifuge was selected, because a suitable used model was available. The SEM Andritz belt press which gave the best results will be used to replace the centrifuge in the future. A table is given showing operating cost breakdown for a vaccum filter, centrifuge, and belt press. (Trubacek-IPC)
W78-06633

TLM TEST OF TANNERY WASTE WATERS BY USING FISH,
Showa Women's Univ., Tokyo (Japan).
For primary bibliographic entry see Field 5A.
W78-06653

GAS CHROMATOGRAPHIC DETERMINATION OF RESIDUAL AMINE LEVELS IN PLANTS (IN RUSSIAN),
All-Union Research Inst. of Agricultural Use Sewage. Staraya Kupavan (USSR).
For primary bibliographic entry see Field 5A.
W78-06699

5F. Water Treatment and Quality Alteration

ANALYTICAL QUALITY ASSURANCE FOR TRACE ORGANICS ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY,
Environmental Monitoring and Support Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-06267

COSTS OF RADIUM REMOVAL FROM POTABLE WATER SUPPLIES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W78-06280

ELECTRO-REGENERATED ION-EXCHANGE DEIONIZATION OF DRINKING WATER,
Southern Research Inst., Birmingham, AL.
T. A. Davis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 910, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/1-77-035, June, 1977. 72 p, 10 fig, 12 tab, 8 ref, 4 append. 68-03-2209.

Descriptors: *Demineralization, *Ion exchange, *Reverse osmosis, *Resins, *Organic compounds, Organic matter, Membrane processes, Bioassay, *Desalination processes, *Water treatment, Waste water treatment, *Deionization, *Electro-Regenerated Ion-exchange Deionization, *Organic solutes, Resin beads.

Development of an Electro-Regenerated Ion-exchange Deionization (ERID) device is described. ERID is an effective process of continuous deionization and removal of salts from drinking water prior to treatment with reverse osmosis (RO) to recover trace organic solutes for bioassay; the device is basically an electrodialyzer with thick depleting compartments packed with a mixture of anion- and cation-exchange resin beads. These provide a conductive medium for electrical transport of ions out of the demineralized water, through ion-exchange membranes, and into a concentrated waste stream. The electro-regenerability, the affinity for organic solutes, and the release of contaminants were evaluated for several ion-exchange resin types. The electrical conductivity of the resins equilibrated with solutions of HCl and NaOH provided an indication of the electro-regenerability of the resins. The uptake of test organic solutes and the release of contaminants was measured in batch and continuous experiments with aqueous media. The best resin combination (a 2:1 mixture of Amberlite IRA-68 and Duolite C-433) could be continuously regenerated while deionizing tap water containing large amounts of calcium, sulfate, and bicarbonate. CaCo3 precipitation in the waste compartments was prevented by acidification of the waste feed. With combined ERID-DO treatment, greater than 90% demineralization was achieved. Uncharged organic solutes tended to pass through with little change in concentration; they could be concentrated by the RO unit if their molecular weights were high enough to permit rejection by the RO membranes. Organic acids and bases removed from solution could be recovered by rinsing with acidic or basic solutions. (Seip-IPA)
W78-06281

WATER QUALITY MONITORING IN DISTRIBUTION SYSTEMS,
National Sanitation Foundation, Ann Arbor, MI.
For primary bibliographic entry see Field 5A.
W78-06284

DESALINATION TECHNIQUES FOR CONVERSION OF BRACKISH WATER INTO POTABLE WATER FOR SMALL COMMUNITIES,
For primary bibliographic entry see Field 3A.
W78-06340

DIRECT FILTRATION OF LAKE MICHIGAN WATER,
Townsend and Associates, Chicago, IL.
R. D. Tanner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 229, Price codes: A02 in paper copy, A01 in microfiche. Research Report, 1974. 20 p, 10 fig, 1 tab, 5 ref. OWRT A-062-ILL.(2).

Descriptors: *Filtration, *Polyelectrolytes, Coagulation, Water treatment, Turbidity, Polymers, Lake Michigan, *Clarification.

The effectiveness of the direct filtration process (which uses a single media sand filter bed), was evaluated as to its capability to clarify Lake Michigan water when cationic polyelectrolytes are used as the sole coagulant. Zeta potential (ZP) measurements controlled polymer dosage according to variations in quantity of suspended particles in the raw water; effluent turbidity and head loss after filtration served as the measures of process effectiveness. During the research period influent water turbidities ranged from 0.65 to 35 FTU. Two identical pilot plant filters, made of plexiglass filled with sand, were utilized. One received only chlorinated lake water; the other received polymer-treated water. Results showed: the four cationic polyelectrolytes studied had a narrow effective concentration range resulting in effluent turbidities at 6.5 hours of filtration less than 0.10 FTU, and concentrations outside this range resulted in higher effluent turbidities (independent of influent turbidity). The relationship between ZP of the particles and the concentration of polyelectrolyte was useful in determining the polyelectrolyte concentration needed to achieve a low effluent turbidity. The ripening period for the filter was reduced/eliminated by using a concentration resulting in a ZP of particles between 5 and 15 mv for all polyelectrolytes studied. The head loss developed during a filter run varied significantly between each of the polymers studied. Effective polyelectrolyte filtration, then, can be achieved by careful attention to polyelectrolyte dosage. (Wares-IPA)
W78-06344

A COMPARISON OF ALUMINUM SULFATE AND ACTIVATED CARBON FOR ORGANIC COLOR REMOVAL FROM GROUNDWATERS,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
J. E. Bowie, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 367, Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis, December, 1975. 86 p, 27 fig, 7 tab, 27 ref, 5 append. OWRT A-084-MISS(2).

Descriptors: *Groundwater, *Color, *Mississippi, Water quality standards, Water sampling, Water supply, *Water treatment, Polyelectrolytes, Economics, *Alum treatment, *Activated carbon treatment, Color removal, Cat-Floc.

Groundwaters that are distributed by municipalities in Mississippi and exceed the U.S. Public Health Service recommended standard of color for drinking water of 15 units were characterized and studied with regard to aluminum sulfate treatability, granular activated carbon treatability, and comparison of the two treatments. The color in the seven waters tested was attributed to hydroxylated aromatic type compounds; the concentration of these substances was directly proportional to the color. The colored groundwaters were soft and of alkaline pH. The aluminum sulfate treatability study resulted in development of a color removal system using alum and a polyelectrolyte 'Cat-Floc.' Ninety percent color removal was achieved at a pH of 6.5, alum dosage of 70 mg/l, and polyelectrolyte of 14 mg/l for water with an initial color of 140 units. Alum alone at a pH of 6.5 produced similar results at doses above 300 mg/l. A specific color polymer interaction was the proposed mechanism of color removal. The activated carbon treatability study utilized both isotherm and column studies with granular carbon. Activated carbon made complete color removal possible. The carbon color equilibrium followed the Langmuir and Freundlich isotherm with correlation coefficents above 90%. Field and lab column studies has similar results. Comparison of the treatments indicated that activated carbon was two to 20 times as expensive in terms of chemical costs, indicating preferability of alum-polyelectrolyte treatment of water to remove color. The appendices contain methodological descriptions and test calculations. (Wares-IPA)
W78-06348

APPLICATION OF COMPUTER MODELING FOR CAPACITY STAGING OF DENVER, COLO., WATER-TREATMENT FACILITIES,
Colorado School of Mines, Golden. Dept. of Basic Engineering.
J. N. Brooks, K. J. Miller, R. C. McWhinnie, E. R. Bennett, and K. D. Linstedt.
Journal of the American Water Works Association, Vol. 70, No. 4, p 184-191, April 1978. 7 fig, 1 tab, 4 ref.

Descriptors: *Water treatment, *Water supply, Cost minimization, *Computer models, *Dynamic programming, *Capacity staging, Long-term planning, Capital costs, Water demand, Decision making, Constraints, Equations, Operation and maintenance, Simulation analysis, Linear programming, *Denver(Colo), *Treatment facilities, Optimization, Systems analysis.

With the high rate of cost escalation for construction and operation of water supply facilities, optimal decisions concerning capital expenditures for expansion of facilities are imperative. Several methods are available which provide for minimizing the capital costs of proposed future facilities for meeting a predicted water demand. Presented is a dynamic programming model that might serve as a guide for evaluating capacity-staging desicions; it was used to examine the utilization of existing and proposed treatment plants within the Denver, Colorado system in order to assess the effectiveness of the system in meeting demand at minimum cost. Results discussed here are intended to show the type of information obtainable from an optimization model. Given are the steps in developing the model: (1) describing the physical system; (2) introducing bounds in the form of constraint equations to limit the ranges of assumed values for the variables; (3) definition of a suitable objective function to be minimized, relating to the total system costs in meeting the prescribed water demand over the planning horizon. Discussed are the specific supplies, demands, treatment components, and constraints of the system. Finally, the scope and limitations of the method are given. (Bell-Cornell)
W78-06559

5G. Water Quality Control

ENERGY RELATED ACTIVITIES AND AN ASSESSMENT OF THE WATER RESOURCE MANAGEMENT ALTERNATIVES IN SOUTH LOUISIANA,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 6B.
W78-06201

PUERTO RICO'S WATER RESOURCES PROBLEMS AND RESEARCH NEEDS.
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.; and Department of Natural Resources, San Juan (Puerto Rico).
For primary bibliographic entry see Field 6B.
W78-06206

ANALYSIS OF PRIORITY WATER RESOURCES PROBLEMS FOR THE SOUTHERN PLAINS REGION,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W78-06207

MANAGEMENT OF URBAN RUNOFF AND WASTEWATER IN THE OSLOFJORD AREA,
Norsk Inst. for Vannforskning, Blindern.
P. Balmer, J. Glomnes, O. Lindholm, and N. A. Saltveit.
Nordic Hydrology, Vol 8, No 4, p 237-248, 1977. 8 fig, 3 tab, 9 ref.

Descriptors: *Urban runoff, *Sewers, *Water storage, *Tunnels, Waste water, Storm runoff, Storm water, Precipitation(Atmospheric), Rainfall, Runoff, Cities, Urban drainage, Sewage treatment, Water pollution, Fjords, Water pollution control, Model studies, Mathematical models, *Oslo(Norway), Retention basins.

To alleviate the pollution in the Oslofjord region, it is planned to transport wastewater to a central treatment plant by a 35 km tunnel system. The objective of the study was to analyze the consequences of a reduced treatment plant capacity vs. the utilization of the tunnel as a retention basin. The analysis was performed by the use of a recently developed mathematical model for urban runoff and drainage. Simulations were performed for large rain events and for all rains during a summer season. The most important result of the study was that the treatment plant could be reduced to half its original capacity if the tunnel was utilized as a retention basin without any increase, in fact a decrease, in the total pollution load on the fjord. (Sims-ISWS)
W78-06214

EROSION AND SEDIMENT CONTROL AUDIOVISUAL TRAINING PROGRAM, WORKBOOK,
Hittman Associates, Inc., Columbia, MD. Environmental and Geosciences Dept.
For primary bibliographic entry see Field 4D.
W78-06228

OPTIMIZATION OF A REGIONAL WATER RESOURCE QUALITY MANAGEMENT SYSTEM,
California Univ., Berkeley.
J. J. Vasconcelos.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-15, 899. PhD Thesis, 1976, 383 p.

Descriptors: *Mathematical models, *Water quality control, *Water resources development, *Water utilization, *Optimum development plans, Water resources, Planning, Algorithms, Mathematical studies, Water management(Applied), Waste water treatment, Simulation analysis, Optimization, *California, Fresno(CA), San Joaquin Valley(CA).

A mathematical model to optimize design and minimize total costs for a regional water supply-waste water treatment management system is presented. The Fresno groundwater basin in the San Joaquin Valley in California was used in a simulation of an integrated water system with five sources of water for 22 water demands. Declining groundwater levels and increasing concentrations

of total dissolved solids and nitrates in groundwater are the major water resource problems in the area. An iterative algorithm which included a linear programming optimization model, a groundwater quantity and quality model, and a data processing-costing program was used to analyze four management alternatives which failed to meet problem constraints. (Schulz-FIRL)
W78-06234

DEVELOPMENT OF A HYDROPHOBIC SUBSTANCE TO MITIGATE PAVEMENT ICE ADHESION,
Ball Bros. Research Corp., Boulder, CO.
For primary bibliographic entry see Field 4C.
W78-06241

SEDIMENT HANDLING AND BEACH FILL DESIGN,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-06245

STATEMENT FOR COMPREHENSIVE WATER POLLUTION CONTROL PROGRAMS,
Public Health Service, Washington, D.C. Div. of Water Supply and Pollution Control.
K. S. Krause.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 747, Price codes: A03 in paper copy, A01 in microfiche. Report, 1963. 32 p, 5 fig.

Descriptors: *River basins, Water pollution treatment, *Water pollution control, *Pollution abatement, *Great Lakes, *Illinois, *Chesapeake Bay, *Delaware River, *Ohio River, Planning, Management, River basin development, Water management(Applied), *Susquehanna River basin, Delaware River Estuary Project, Great Lakes-Illinois River Basins, Upper Ohio River Basin, *Water Pollution Control Act.

Comprehensive river basin water pollution control programs, mandated by and funded through the Federal Water Pollution Control Act, are described. Programs, strategies, goals and an overview of pollution problems and current abatement procedures are outlined for the following river basin programs: the Chesapeake Bay-Susquehanna, the Delaware estuary, Great Lakes-Illinois, the Upper Ohio, and the Arkansas-Red Rivers. Plans for comprehensive water pollution control and future plans and abatement strategies are outlined. (Seip-IPA)
W78-06264

DRAFT ENVIRONMENTAL IMPACT STATEMENT - CHEMICAL WASTE INCINERATOR SHIP PROJECT (VOLUME 1 OF 2 - ENVIRONMENTAL ANALYSIS AND APPENDICES I, II, AND III, U.S. ENVIRONMENTAL PROTECTION AGENCY: DISPOSAL OF ORGANOCHLORINE WASTES BY INCINERATION AT SEA).
Maritime Administration, Washington, D.C.
For primary bibliographic entry see Field 5E.
W78-06265

DRAFT ENVIRONMENTAL IMPACT STATEMENT - CHEMICAL WASTE INCINERATOR SHIP PROJECT (VOLUME 2 OF 2 - APPENDIX IV, U.S. ENVIRONMENTAL PROTECTION AGENCY: DISPOSAL OF ORGANOCHLORINE WASTES BY INCINERATION AT SEA).
Maritime Administration, Washington, D.C.
For primary bibliographic entry see Field 5E.
W78-06266

INVERTED SIPHONS FOR OIL TRAPPING,
Calspan Corporation, Buffalo, NY.
For primary bibliographic entry see Field 5D.
W78-06268

SEWAGE FACILITIES CONSTRUCTION REPORT, 1971.
Environmental Protection Agency, Washington, DC. Water Quality Analysis Branch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 596, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-440/9-73-002, 1971. 16 p, 5 fig, 15 tab, 1 append.

Descriptors: *Sewage treatment, *Treatment facilities, Construction, Cost analysis, Contracts, *Sewage facilities construction reports, Sewage facilities.

A report, prepared from contract award notifications (collected by EPA) of sewage facilities construction and related fields, is presented. Data concerning all contracts awarded in the United States are included. The data show that: (1) contract awards for sewage treatment facilities and collection sewers in the 19 years from 1952 through 1971 total 18.6 billion dollars; (2) the rate of growth in spending for sewage facilities construction has significantly exceeded the rate of inflation and the population growth rate. (The annual per capita contract awards measured in constant dollars increased 78% from 1957 to 1971.); (3) per capita sewage facilities construction awards are generally higher in the densely populated areas of the country such as the Northeast and the Great Lakes regions; and (4) Federal participation in the form of EPA construction grants has increased dramatically in the last 2 years - from 14% of total contract awards in 1969 to 55% in 1971. (Seip-IPA)
W78-06287

SEWAGE FACILITIES CONSTRUCTION REPORT 1972, 1973, 1974.
Environmental Protection Agency, Washington, DC. Point Source Analysis Branch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 683, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-440/9-75-012, 1975. 33 p, 3 fig, 30 tab, append.

Descriptors: *Sewage disposal, *Sewage treatment, *Treatment facilities, *Statistics, Contracts, Construction, Analysis, Environmental engineering.

A summary and analysis of contracts awarded by the U.S. Environmental Protection Agency during calendar years 1972, 1973, and 1974 for construction of sewage facilities are presented. Information is given by facilities category (treatment and collection); basic statistics on trends, area of award, basis of award, data variations, and federal participation are presented and compared with awards made previously. Analysis of the award statistics showed that in the three year period considered, contract awards for sewage facilities construction totalled $10 billion, representing 35% of the total amount (28.7 billion) spent on sewage facilities construction since 1952. The rate of growth in spending for sewage facilities construction has exceeded the rate of inflation and the population growth rate. The annual per capita contract awards measured in constant dollars increased 155% from 1957 to 1974. The appendix contains listings of contract awards by size, geographic area, and population size group, and indicates percentage changes in amounts of awards and their distribution. (Wares - IPA)
W78-06288

MUNICIPAL SLUDGE MANAGEMENT: EPA CONSTRUCTION GRANTS PROGRAM. AN OVERVIEW OF THE SLUDGE MANAGEMENT SITUATION,
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
R. K. Bastian.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 695, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-430/9-76-009, (McD-30), April, 1976. 64 p, 1 fig, 6 tab, 57 ref, 7 append.

Descriptors: *Management, *Sludge, Waste disposal, Sewage disposal, Costs, Environmental effects, Municipal wastes, Facilities, Construction, *Cost-effectiveness.

Available information on municipal sewage sludge production and alternatives for disposal and/or utilization are summarized; Office of Water Program Operations (OWPO) activities in this area are reviewed. Over 5 million dry tons of municipal sludge are estimated to be produced and disposed of annually. Current disposal methods include incineration, landfill, land application (e.g., croplands spreading), and ocean disposal. Of more than 22,000 U.S. treatment plants, over 5,000 are wastewater treatment ponds with few sludge disposal problems. Fewer than 350 of those remaining are larger capacity than 10 million gallons/day, with over 65% being less than 1 million gallons per day in design flow. Both capital and operations and maintenance costs for various sludge management alternatives vary depending on energy, transportation, land, and manpower costs, monitoring requirements, and regulatory criteria. In general, from 30 to 50% of a conventional treatment plant's capital costs go for sludge management. Although most available sludge disposal/utilization options can be implemented with minimal negative environmental impacts, consideration must be given to potential intermedia environmental impacts and economic and other impacts when designing and operating such systems. Innovative technologies for sludge management and disposal are also described. Projects and outputs of OWPO sludge management activities are listed; need for future research is indicated. The Appendices contain statistics, status of grants funding, criteria for disposal and utilization, program guidance on cost eligibility, and a listing of recent reports on municipal sludge management. (Wares-IPA)
W78-06290

COST ESTIMATES FOR CONSTRUCTION OF PUBLICLY-OWNED WASTEWATER TREATMENT FACILITIES. 1976 NEEDS SURVEY, (REPORT TO CONGRESS).
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 716, Price codes: A20 in paper copy, A01 in microfiche. Report No. EPA-430/9-76-010, (McD-48A), February 1977. 83 p, 45 tab, 4 append.

Descriptors: *Waste water treatment, *Treatment facilities, Economics, *Costs, Cost-benefit analysis, Pollution abatement, Water pollution, Surveys, *Estimated costs.

Cost estimates for construction of needed publicly-owned wastewater treatment facilities for eight categories in each of the United States and territories are presented. The survey estimates the overall remaining needs for the conveyance and treatment of municipal sewage and control of pollution from combined sewer overflows to be $96 billion, of which $52 billion are needed for new treatment plants and interceptors. The 1976 estimate is 37% lower than the 1974 needs survey estimate of $151 billion since the latest estimates reflect a specially formulated, consistent survey methodology and more information available from sources such as new facility plans, basin plans, and discharge permits. Additionally, new projects approved between the 1974 and 1976 surveys reduced the estimate by more than $8 billion. The 1976 estimate includes $18 billion for control of pollution from combined sewer overflows, which is less than half the estimate made in 1974; (that estimate included substantial costs for facilities

serving the purposes of urban drainage or flood control). An estimate of $54 billion more is given for the control of pollution from separate storm sewers as distinguished from other types of facilities. Appendices describe conduct of the 1976 survey, summary tables by states and territories, survey costs, and information on cost assessments and estimates. (Wares-IPA)
W78-06291

STATISTICAL SUMMARY, 1968 INVENTORY, MUNICIPAL WASTE FACILITIES IN THE UNITED STATES,
Federal Water Quality Administration, Washington, DC. Div. of Technical Support.
K. A. Jenkins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 732, Price codes: A03 in paper copy, A01 in microfiche. FWQA Publication No. CWT-6, 1970. 42 p, 1 fig, 29 tab, 6 ref.

Descriptors: *Sewage treatment, *Treatment facilities, Census, Sewage disposal, United States, Analysis, Waste water treatment.

A summary and an analysis of data on sewage treatment facilities in the United States and its territories are presented; data were collected between Jauary 1, 1968 and July 14, 1969, but are intended to reflect municipal sewage collection, treatment, and disposal facilities existing as of January 1, 1968. Certain data from four previous inventories (1940, 1945, 1957, and 1962) are included for comparison and to provide a measure of progress and trends. Analyses of the data and of trends in collection methods, treatment and disposal of the wastes are included. (Seip-IPA)
W78-06293

A MODEL FOR MULTI-PERIOD REGIONAL WASTEWATER PLANNING,
North Carolina Univ. at Chapel Hill.
C. H. Chiang.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-17,309. PhD Thesis, 1976, 176 p.

Descriptors: *Mathematical models, *Algorithms, *Planning, *Water management(Applied), *Optimum development plans, Costs, Computer models, Sewerage, Treatment facilities, Waste water treatment.

A method for determining the location, timing, and scale of regional waste water treatment plants, sewers, and pumping stations with a heuristic algorithm composed of several subprograms is presented. The algorithm is capable of producing marginal cost analyese, examining tradeoffs between economics of scale in treatment and waste water conveyance, accounting for existing facilities, and considering plant capacity. Basically an iterative procedure, the algorithm can be used to provide fast, possible, least-cost solutions to several types of waste water planning problems. (Schulz-FIRL)
W78-06299

STATUS REPORT ON COMPLIANCE WITH THE CHLOR-ALKALI MERCURY REGULATIONS - 1975.
Department of the Environment, Ottawa (Ontario). Water Pollution Control Directorate.
Economic and Technical Review Report EPS 3-WP-77-12, September, 1977, in English and French, 17 p, 18 p, 5 append.

Descriptors: *Mercury, *Effluents, *Waste water disposal, *Industrial wastes, *Pollution, Discharge measurement, Chlorine, Flow measurement, Sampling, Control systems, Regulation, Monitoring, *Water quality standards, *Canada, *Chlor-alkali industrial plants.

This report contains a review of the measures taken to curtail mercury losses to liquid effluents from chlor-alkali plants in Canada. Both mercury consumption and losses have been drastically reduced since 1970, when the significance of discharging inorganic mercury was first realised in Canada. Mercury consumed by the plants, per unit of production, has been reduced by approximately 50 percent. Mercury losses to liquid effluents have been reduced to less than 1 percent. Mercury purchases have also declined considerably in Canada. Plants records, and regulatory monitoring by both Federal and Provincial environmental control agencies, all confirm that these reductions are very significant. (WATDOC)
W78-06308

RUNOFF FROM A LOW-COST MANURE STORAGE FACILITY,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 5B.
W78-06314

RUNOFF FROM A PASTURED WATERSHED IN LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-06332

DRIP IRRIGATION TO REVEGETATE MINE WASTES IN AN ARID ENVIRONMENT,
ASARCO, Inc., Tucson, AZ.
For primary bibliographic entry see Field 3B.
W78-06339

DIRECT FILTRATION OF LAKE MICHIGAN WATER,
Townsend and Associates, Chicago, IL.
For primary bibliographic entry see Field 5F.
W78-06344

PROCEEDINGS, MISSISSIPPI WATER RESOURCES CONFERENCE, 1975.
Mississippi State Univ., Mississippi State. Water Resources Research Inst.
For primary bibliographic entry see Field 2J.
W78-06351

SOME COMMON ASPECTS OF PHYSICAL-CHEMICAL INDICES OF TOXIC SUBSTANCES AND THEIR PERMISSIBLE CONCENTRATIONS IN ATMOSPHERIC AIR, AIR OF WORKING AREAS AND WATER (IN RUSSIAN),
Nauchno-Issledovatelskii Inst. Gigieny Truda i Professionalnykh Zabolevanii, Leningrad (USSR).
E. I. Lyublina.
Gig Sanit 8, p 88-92, 1976.

Descriptors: *Organic compounds, *Lethal limit, *Water quality standards, *Air pollution, Water pollution control, Public health, Toxicity.

Direct linear correlatin was established between 252 volatile organic compounds and their volatility in relation to LC50, log permissible concentration (PC) in working area and log daily average PC in atmospheric air. For log PC in water, correlation was established between water solubility of substances and saturating concentrations. Daily effect of atmospheric air leads to a dynamic balance between the concentrations in the air and in the human body of all organic compounds. This requires special attention in standardizing PC of concentrations which saturate the air.--Copyright 1978, Biological Abstracts, Inc.
W78-06354

OPTIMAL ARTIFICIAL AERATION DESIGN IN POLLUTED STREAMS RECEIVING THERMAL DISCHARGE,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
S. H. Lin, L. T. Fan, and C. L. Hwang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 558, Price codes: A03 in paper copy, A01 in microfiche. Kansas Water Resources Research Institute, Manhattan, Contribution Number 127, (1975). 32 p, 12 fig, 14 ref. OWRT B-030-KAN(10), 14-31-0001-3592.

Descriptors: Water quality, *Water pollution control, *Aeration, Thermal pollution, Design criteria, Dissolved oxygen, Cooling water, Water quality standards, *Optimal artificial aeration scheme, *Thermal discharge, *Continuous maximum principle, *Organic waste discharges, Optimal control policy, Minimum DO concentration, Non-zero artificial aeration.

The optimal artificial aeration scheme for a polluted stream which receives additional thermal discharge is studied. The continuous maximum principle is employed to find the optimal control policy which minimizes the system objective function and maintain an appropriate water quality in the stream. The system objective function which consists of the DO violation penalty from the desired value and the artificial aeration effort increases significantly with increasing amount of thermal discharge in comparison with the isothermal case. The system objective function also increases exponentially with increasing upstream BOD concentration. A design procedure is presented to find the optimal artificial aeration control policy which is able to maintain the water quality at a minimum legal requirement.
W78-06357

EFFICIENT AND EQUITABLE PRICING FOR WASTEWATER SYSTEMS: THE MADISON METROPOLITAN SEWERAGE DISTRICT,
Wisconsin Univ.- Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5D.
W78-06358

COST MINIMIZATION FOR COAL CONVERSION POLLUTION CONTROL: A MIXED INTEGER PROGRAMMING MODEL,
Utah Water Research Lab., Logan.
M. F. Torpy, A. B. Bishop, and R. Narayanan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 173, Price codes: A05 in paper copy, A01 in microfiche. Utah Water Research Laboratory, Water Resources Planning Series Report P-78-001, March 1978. 85 p, 40 tab, 58 fig, 2 append. OWRT A-032-UTAH(1), 14-34-0001-7094.

Descriptors: Energy development, Energy conversion, Water resources systems, Costs, Pollution control, Water quality, Water conservation, Coal, Model studies, *Mixed integer programming, Cost analysis.

A mixed integer program was structured to identify the least cost combinations of recycling and treatment alternatives that can be used to control the liquid, solid, and gas waste streams produced from a 750-megawatt coal fired steam electric power plant. The model compared the ability of methods of liquid stream recycle and waste discharge treatment to meet given air and water quality standards. The model was then used to study the effects on the optimal solution of changes in capital, operation and maintenance, and energy and water costs. In addition, the effects on optimum system design of changes in particulate and sulfur oxide emission standards and stream discharge standards were evaluated. Nonlinear cost functions for system components were structured with binary integer variables to define

the ordinate intercept and with continuous variables to define the slopes of total cost curve segments. The binary and continuous variables were associated with each other in pairs to approximate nonlinear total cost functions of alternative pollution control units. The optimal plant design was sensitive to increases in capital, operation and maintenance, and energy costs as well as air emission standard changes. The model identified the optimal treatment unit alternatives and their sizes when segments of the total costs and environmental standards were changed. The optimal solutions always identified water recycle, rather than stream discharge, as the optimal production strategy.
W78-06359

DEVELOPMENT AND IMPLEMENTATION OF A REGIONAL WATER PLANNING DATA MANAGEMENT SYSTEM,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W78-06360

MARINE POLLUTION: DIAGNOSIS AND TREATMENT, (MEERESVERSCHMUTZUNG: DIAGNOSE AND THERAPIE),
S. A. Gerlach.
1976.

Descriptors: *Trace elements, Marine pollution, *Mercury, *Lead, Water pollution control, Aquatic life, *Heavy metals, Legislation, Oil pollution, Sewage, *Waste disposal, Chlorinated hydrocarbons, Pesticides.

The pollution of water by domestic and industrial sewage and oil, the dumping of wastes in open water and their effect on aquatic life are described. Chapters on possible global marine pollution by Hg, Pb, trace elements, heavy metals, and chlorinated hydrocarbons are included. Legislation aimed at decreasing marine pollution is briefly discussed.--Copyright 1978, Biological Abstracts, Inc.
W78-06361

IMPACT OF FEDERAL AND STATE WATER QUALITY LAWS ON ALASKA NATIVE REGIONAL CORPORATIONS.
Alaska Univ., College. Inst. of Water Resources.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 158, Price codes: A02 in paper copy, A01 in microfiche. Termination Report, February, 1978. 9 p, 1 append. OWRT A-052-ALAS(1), 14-31-0001-5002.

Descriptors: *Legislation, *Water quality, *Alaska, Development, Standards, Nunam Kitlusisti, Federal Water Pollution Control Act, Section 208(Public Law 92-500), Alaska Native regional corporation.

An investigation of existing Federal and state water quality laws was conducted to determine impacts on development activities of Alaska Native regional corporations. The potential use of section 208 of Public Law 92-500, the 1972 amendments to the Federal Water Pollution Control Act, and other relevant planning laws was examined. Materials were compiled on Federal and state water quality legislation and regulations (with focus on the new requirements of P.L. 92-500); new and existing sources of pollution, nondegradation, and assimilative capacity were considered. The goal of listing and analyzing Federal and state statutory limitations on discharge into navigable waters was not achieved. Researchers worked with Nunam Kitlusisti (the environmental branch of the Association of Village Council Presidents), which is part of one of the 12 Alaska Native regional corporations. Investigators instigated involvement of the Native corporation in the 208 planning process for the development and implementation of best management practices for nonpoint source pollution in areas not designated as 208 planning regions. A published article (found in the appendix) resulted from the research and summarizes study results and Federal laws regulating water quality. The expense of water pollution control systems for new industries and the lack of government policy on nondegradation is emphasized with regard to Native corporations. The status of Nunam Kitlusisti's efforts to obtain designation as a 208 planning agency is addressed. (Seip-IPA)
W78-06366

VILLAGES AND SEQR,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
J. A. Stanturf, and Y. M. Perret.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 333, Price codes: A03 in paper copy, A01 in microfiche. Handbook, March, 1977. 43 p, 3 fig, 2 tab, 1 ref, 4 append. OWRT A-056-NY(4).

Descriptors: *Environmental effects, *New York, *Permits, Decision making, State governments, Water resources development, Local governments, Legislation, *State Environmental Quality Review Act(SEQR), Villages, Environmental Impact Statement, Flowcharts, Lansing(NY), Guidelines.

The requirements of the State Environmental Quality Review (SEQR) Act (New York) are discussed and the actions a village can take to meet these requirements are described. The SEQR process requires three phases: (1) An EIS by state-level agencies, (2) an EIS on direct actions of a village or other local government, and (3) an EIS at both state and local levels to include permits granted to private applicants. Villages were required to devise and adopt procedures covering direct actions by April 1, 1977. These procedures enabled a village to identify projects requiring an EIS, determine who will be responsible for preparing an EIS, and incorporate the information in the EIS into the decision-making process. Procedures are suggested for meeting these responsibilities, such as explaining the general SEQR process, suggesting steps a village can take to meet SEQR responsibilities, showing how to determine the need for an EIS, and examining the role of a village as lead agency and its relationship with other government agencies in the SEQR process. A fictional account of how one village uses SEQR is used to illustrate the process. Five examples from the village of Lansing, New York, illustrate ways SEQR will affect villages, i.e., overhead light control, access roads, zoning ordinances, and sewer interceptors and feeders. The appendices present guidelines for determining significant environmental effects, and the SEQR Act and SEQR Act amendments. (Wares-IPA)
W78-06367

INDUSTRIAL POINT SOURCES OF PETROLEUM: POLLUTION LOADS AND ECONOMIC PARAMETERS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W78-06376

FERTILIZING POND WATER: CRITICAL REVIEW (IN SERBO-CROATIAN),
Poliopr. Fak., Zavod Poliopr. Zool., Zagreb, Yugosl.
For primary bibliographic entry see Field 5C.
W78-06406

VIRUS ADSORPTION BY FIVE SOILS,
Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5B.
W78-06422

1978 SEWERAGE PROJECT FORECAST.
Western Construction, Vol 53, No 2, p 32, February, 1978.

Descriptors: *Sewerage, *Legislation, *Federal government, *Financing, *Interceptor sewers, Construction, Sewers, Grants, Sanitary engineering, Waste water treatment, Municipal wastes.

Water project construction legislation, approved by the United States Congress, has allocated $24.5 billion to be appropriated over the next five years. According to the National Utility Contractors Association, the legislation will provide an economic boost to construction firms in 1978. The additional funding comes at the end of an $18 billion allocation established by the 1972 Clean Water Act. A study completed by the National Utility Contractors Association refuted the contention by the Environmental Protection Agency that collector systems are not a cost-effective approach to waste water management. The recent legislation mandates that more than 25% of the funds be used for the construction of collectors and interceptors, rehabilitation, or combined sewer separation. The appropriation is part of the 1977 Clean Water Act approved by Congress. (Lisk-FIRL)
W78-06423

THE BARCELONA CONVENTION AND ITS PROTOCOLS,
Ministry of Foreign Affairs, Rome (Italy).
A. S. Lagrange.
Ambio, Vol 6, No 6, p 32^{p}-332, 1977. 8 ref.

Descriptors: *Oceans, *International commissions, *Water policy, *Water pollution control, *Water pollution sources, Ships, Aircraft, Legal aspects, International law, Law of the sea, Permits, Waste water disposal.

The 1976 Barcelona Convention, in which 16 Mediterranean coastal countries participated, resulted in international agreements for controlling pollution in the Mediterranean Sea. Fifteen countries have signed agreements establishing the Convention as a framework for protection of the ocean from pollution, control of the dumping of pollutants by ships and aircraft, and regulation of pollution in the Mediterranean Sea by oil spills. Three categories of wastes were identified within the protocol regulating pollution by ships and aircraft. One category lists the various substances which are totally prohibited; the second details those pollutants which require a special permit from the appropriate authority before dumping; and the third category covers the general range of all other wastes and matter for which a general dumping permit is necessary. A list of totally prohibited pollutants, including acid and alkaline compounds, is currently under consideration for adoption. The second pollution abatement protocol adopted by the Convention establishes a regional data collection center and mandates international cooperation in controlling, monitoring, recovering, and identifying pollution caused by an emergency or accidental situations. No agreement could be reached among the participating countries on the control of land-based pollution sources. (Lisk-FIRL)
W78-06424

ENVIRONMENTAL POLLUTION CONTROL IN METROPOLITAN ATHENS,
Environmental Pollution Control Project, Athens (Greece).
A. Gilad.
Ambio, Vol 6, No 6, p 350-354, 1977. 6 fig, 1 tab.

Descriptors: *Pollutant identification, *Water pollution, *Air pollution, *Solid wastes, *Oceans, Landfills, Treatment facilities, Incineration, Industrial wastes, Water pollution control, Air pollution effects, Recycling, Waste water treatment, Municipal wastes.

Water, air, solid waste, and noise pollution controls under consideration for Athens, Greece, are reviewed. A Greek Environmental Pollution Control Project initiated in conjunction with the United Nations Development Program and the World Health Organization, was established in 1973 as an environmental data collection center and coordinator of pollution abatement policies. A liquid wastes disposal system is being developed based on analyses of municipal and industrial effluent data, water use, and the impact of effluent discharges on water quality. Bioindicators have also been traced in receiving waters to determine the long-term effects of effluent discharge. Noise level surveys were conducted in six areas of Athens to delineate noise sources. Traffic was found to be the major source of noise pollution; legislation is pending that will establish maximum noise levels. Disposal of solid wastes in sanitary landfills is considered the most economic alternative for pollution control. Studies were conducted on the disposal of industrial wastes and resource recovery of methane gas and scrap paper. The impact of air pollution on materials, archeological monuments, and public health was monitored; air pollution controls are under development. (Lisk-FIRL)
W78-06425

COMPUTERIZATION AND AUTOMATION OF WASTEWATER SYSTEMS,
S. J. Hadeed.
Journal Water Pollution Control Federation, Vol 50, p 5-7, January, 1978.

Descriptors: Computers, *Flowmeters, *Systems analysis, *Automation, *Data collections, Cost analysis, Treatment facilities, Data storage and retrieval, Monitoring, Control systems, Waste water treatment, Municipal wastes.

The advantages of automatic or computer control of municipal waste water treatment facilities are reviewed. Automation of sewage treatment plants is recommended as a means of reducing labor costs and human error. Large-scale facilities and industries have converted to automatic control to increase equipment life, reduce instrument size and maintenance requirements, and conserve chemical and energy consumption. Computerized operations are capable of collecting and reacting to data from flowmeters, thermocouples, pressure meters, thermometers, and other metering units. Plant efficiency can be computer controlled by comparing collected data with current instrument readings. Equipment malfunctions can be detected and even avoided by automatic monitoring of instruments and plant processes. The quality and quantity of the effluent during each treatment process is monitored by sampling units. The evaluation of computer operation in municipal waste treatment plants is based on the efficiency of the automatic processes and the cost factors involved in automation. An alternative for small treatment plants is the installation of a time-sharing terminal for data collection and analysis. (Lisk-FIRL)
W78-06427

OXYGEN INJECTION AT WORK'S INLET.
For primary bibliographic entry see Field 5D.
W78-06457

SEALING A SEWAGE LAGOON FOR HALF THE COST,
J. Brown.
Engineering and Contract Record, Vol. 91, No. 1, p 37, January, 1978.

Descriptors: *Bentonite, *Lagoons, *Sewage lagoons, *Linings, *Sealants, Plastics, Seepage, Rubber, Protective coatings, Waste water treatment, Municipal wastes.

Polymer-treated bentonite has been used instead of conventional materials for sewage lagoon linings at the White River sewage treatment plant in Ontario, Canada. The polymer-treated bentonite Volclay SG 40, supplied by American Colloid Co of Lovell, Wyoming, swells to transform permeable, sandy soils into water-tight, sealed basins. The bentonite, when mixed with sand and water, doubles in size to form an impermeable seal, especially useful in swampy regions. A mixed blanket technique was used to apply the bentonite to the White River sewage lagoons. A 6.3 mm layer of the bentonite was applied to a section of the lagoon at a rate of 7.32 kg/cu meter. Two more layers, each 3 mm thick, were applied to the lagoon in opposing directions and the bentonite was raked into the sand to a depth of 50 mm and compacted. A 25 mm layer of SG 40 gel, a mixture of bentonite and water, was applied to the waste inlet at a depth of 609 mm to prevent erosion of the bentonite seal. One sewage lagoon required 227 tons of SG 40 using the mixed blanket technique. (Lisk-FIRL)
W78-06464

DEODORIZATION MEASURES FOR NIGHT SOIL TREATMENT PLANTS (SHINYO SHORI SHISETSU NO DASSHU TAISAKI NI TSUITE),
F. Toyoda, and M. Chugo.
Ebara infiruko joho, (Ebara-Infilco Engineering Review), No. 71, p 23-29, October, 1977. 6 fig, 7 tab, 2 ref.

Descriptors: *Deordorization, *Treatment facilities, *Odor, *Air pollution, *Gases, *Ozone, Adsorption, Incineration, Density, Waste water treatment, Sewage effluent, Municipal wastes.

Deodorization of sewage effluent gases with similar densities was evaluated for waste water treatment facilities using combined treatment processes. Deodorization techniques often employed are scrubbing, ozonation, adsorption, and incineration. Conventional deodorization methods treat gases for the different treatment processes together by one of the conventional methods. The combined treatment of gases was not considered adequately effective or economic. Odor-bearing gases produced during treatment in waste water facilities were collected and combined according to high, medium, or low density. These similar density gases were then deodorized by a combination of treatment methods applicable to the specific density characteristics of the gases. Although several types of equipment were required in the treatment plant, this method of deodorization was considered a more effective treatment technique. (Lisk-FIRL)
W78-06468

ENVIRONMENTAL MANAGEMENT IN A MEDITERRANEAN PORT CITY: HAIFA,
United Nations Environment Programs, Geneva (Switzerland). International Labor Office.
H. Z. Evan.
Ambio, Vol 6, No 6, p 346-349, 1977. 2 fig, 1 tab.

Descriptors: *Haifa(Israel), *Water quality control, *Air pollution, *Solid waste, *City planning, *Monitoring, Microclimatology, River basin commissions, Coasts, Landfills, Recycling, Industrial wastes, Oil wastes, Municipal wastes.

A two-year experimental environmental management project conducted in Haifa, Israel, was cosponsored by the Environmental Protection Service, the city of Haifa and the United Nations Environment Program. A municipal agency was established to monotor air quality, river and beach pollution, and solid waste disposal. The agency was also responsible for establishing industrial cooperation, urban planning studies, and information services to public and legislative bodies. Air quality management has focused on monitoring stations, emission inventory, microclimatic studies, and industrial stack emissions, especially during inversions. An autonomous River Authority has been proposed to prevent polution of the Kishon River with agricultural and industrial wastes. A 1,000 ton/day recycling facility has been proposed as a solution to the diminishing sanitary landfill areas. Reduction of coastal pollution by tanker oil and bilge water has been attempted by the provision of cleaning facilities and increased surveillance. Urban planning has concentrated on limiting population densities and separating residential and industrial areas. Legislation has been introduced for the dissemination of information to the public and for administrating guidelines. (Lisk-FIRL)
W78-06470

USING PLANTS FOR WASTEWATER TREATMENT,
California Univ., Berkeley. Sanitary Engineering Research Lab.
C. G. Golueke.
Compost Science, Vol. 18, No. 5, p 16-20, September-October, 1977. 1 tab, 7 ref.

Descriptors: Algae, *Floating plants, *Submerged plants, *Aquatic plants, *Waste water treatment, *Vascular tissues, Water hyacinth, Chlorella, Euglena, Bulrushes, Aquatic weeds, Nitrogen, Phosphorus, Harvesting of algae, Harvesting, Feeds, Municipal wastes.

Waste water treatment systems using algae, duckweed, and water hyacinths were evaluated for pollutant conversion or removal capabilities, ease of harvesting, and potential food or fertilizer source. The use of algae in waste water treatment requires a symbiotic relationship with bacteria which break down the complex organic compounds to nutrients usable by the algae. Harvesting of the algae is difficult because of the microscopic size and low specific gravity of algae cells. The algae provide a source of protein for animal feed. The vascular, floating duckweeds are capable of doubling in quantity over 3-7 days in a semitropical climate by absorption of nutrients. These lemnaceae are easily harvested, but wind can cause large accumulations of colonies that decay. Dewatering of the duckweed would be required before use as an animal feed and oxalic acid concentrations must be considered. Emergent vascular plants, such as reeds and bulrushes, ae grown in a bed containing sand and gravel upon which sewage effluent is applied. This method of treatment produces a clear, neutral effluent with low BOD concentrations and pathogenic bacteria counts but with residual phosphorus and nitrogen. Water hyacinths are capable of removing 80% of the nitrogen and 40% of the phosphorus, as well as amounts of potassium, calcium, magnesium, and sodium, from a sewage pond within a two day period. Vehicles from which harvesting operations are conducted are hindered by the masses of hyacinths in the water. The plants would have to be dewatered by 90-95% before use as an animal feed. (Lisk-FIRL)
W78-06483

ORANGE COUNTY AUGMENTS WATER SUPPLY WITH RECLAMATION SYSTEM.
For primary bibliographic entry see Field 5D.
W78-06487

SEWAGE ODOR CONTROL WORKS IN BELOIT, WISCONSIN,
Will Ross, Inc., Milwaukee, WS.
J. D. Bryson, C. A. Davis, and F. J. Zuicarelli.
Water and Sewage Works, Vol. 125, No. 1, p 82-83, January, 1978.

Descriptors: *Odor, *Neutralization, *Hydrogen sulfide, *Ammonia, *Gases, Air pollution, Chemical reactions, Digestion tanks, Aromatic compounds, Waste water treatment, Treatment facilities, Municipal wastes.

An electrical deodorizer at the Beloit, Wisconsin, sewage treatment plant neutralizes odors produced in the clarifiers by mixing the gases with a dry vapor containing modified and natural oils and Neutrox Gamma, an aromatic compound. The inflow of odorous air into the unit's chamber is controlled by an aperture which allows the proper mixture of air with the dry vapor for neutralization. The dry vapor containing the special neutralizing formula is contained in cartridges which inject the adequate amount of vapor for neutralizing odors. The neutralizing unit replaced a biodigestor tank which was ineffective in the winter months and expensive to maintain. The level of odor in the contaminated air is sampled in monitoring inlets; dry vapor treatment is controlled by the odor contamination levels in the samples. Hydrogen sulfide and ammonia are the primary odor causing gases produced in the treatment facility. The total cost of the odor neutralizing unit, including 48 cartridges, was $2,585. (Lisk-FIRL)
W78-06489

SEWAGE FARMING...WHY IT MAY BE IN YOUR FUTURE.
The American City and County, Vol 93, No 1, p 48-49, January, 1978.

Descriptors: *Return flow, *Infiltration, *Overland flow, *Irrigation, *Load distribution, Hydraulic properties, Biochemical oxygen demand, Phosphorus, Suspended solids, Slopes, Surface runoff, Induced infiltration, Irrigation practices, Permeability, Waste water treatment, Municipal wastes.

Land applications of treated sewage effluent by crop irrigation, rapid infiltration, and overland flow are evaluated and design loading rates are developed. The field size required for slow rate application by crop irrigation is dependent upon the hydraulic and nitrogen loadings. Hydaulic loading, the sum of all water uptake and loss rates, should not allow runoff. Rapid filtration applications are dependent upon and soil permeability and the percolation rate of waste water through the soil to the groundwater. Continuous infiltration of an area causes solids accumulation which governs the infiltration loadings. There is negligible crop uptake of water and nitrogen during rapid infiltration; nitrogen removal is controlled by nitrification and denitrification in the soil. Overland flow applications are limited when the slope of the area is more than 6%, the land area is less than 150 ft long in the direction of flow, or during cold periods when biological activity is low. Overland flow, in which waste water is treated by biological oxidation, the three systems but achieves high BOD and suspended solids removal rates. Pretreatment measures suggested for all three processes are: solids and organics removal, as well as disinfection, for slow irrigation; solids removal for rapid infiltration; and extractable phosphorus improvement for overland flow. (Lisk-FIRL)
W78-06494

LEAK DETECTOR.
Water and Waste Treatment, Vol. 20, No. 11, p 32, November, 1977.

Descriptors: *Chlorine, *Chlorination, *Disinfection, Equipment, *Quality control, Analytical techniques, Leakage, Water purification, Waste water treatment, Flowmeters, Flow measurements, Gases, Municipal wastes.

The English company of Fischer and Porter Ltd., Workington, Cumbria, has developed an automatic chlorination system and a device for the detection of chlorine gas leaks in waste water treatment facilities. The Chloralert Chlorine Leak Detector warns of chlorine gas in the surrounding atmosphere with an alarm light and activates external alarms through electrical contacts. The Chlorimatic chlorination system controls chlorine dosages applied to waste effluent and water supplies. The system, which supplies exact proportions of chlorine gas to varying waste water flow rates and qualities, is vacuum operated and solution fed. The Chlorimatic system, used in processes requiring up to 500 lb of chlorine gas/day, consists of a vacuum regulator, a flowmeter, an ejector, and an automatic control valve developed by Fischer and Porter Ltd. (Lisk-FIRL)
W78-06508

QUALITY CRITERIA FOR WATER, JULY 1976.
Environmental Protection Agency, Washington, D.C. Office of Water and Hazardous Materials. (1977). 256 p, 23 tab.

Descriptors: *Water quality standards, *Water pollution effects, *Lethal limit, Pollutant identification, *Aquatic environment, Aquatic life, Recreation, *Public health, *Toxicity, *Pollutants, Chemicals, Industrial wastes, Domestic wastes, Waste identification, Trace elements.

This volume addresses the effects of those basic water constituents and pollutants that are considered most significant in the aquatic environment in the context of present knowledge and experience. The format for criteria presentation has been altered substantially from the previous volumes. It is believed that the alphabetical arrangement of the water quality constituents and the form in which the information is arranged will be of considerable help to the reader in using this volume. For each basic water constituent or pollutant there is a recommended criterion, an introduction, a rationale supporting the recommended criterion, and a list of the references cited in the development of the recommendation. The volume is to recommend criteria levels for a water quality that will provide the protection and propagation of fish and other aquatic life and for recreation in and on the water in accord with the 1983 goals of P. L. 92-500. Criteria also are presented for the domestic water supply use. Generally, these uses require water of the highest achievable quality, and water quality that supports these uses will also be suitable for agricultural and industrial uses. (See W74-12674 and W74-05417)
W78-06527

AN ASSESSMENT OF ESTUARINE AND NEARSHORE MARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point. Applied Marine Science and Ocean Engineering.
For primary bibliographic entry see Field 2L.
W78-06528

OIL SPILLS, AND SPILLS OF HAZARDOUS SUBSTANCES.
Environmental Protection Agency, Washington, D.C. Div. of Oil and Hazardous Materials.
For primary bibliographic entry see Field 5B.
W78-06529

THE SEVERN ESTUARY AND THE BRISTOL CHANNEL, AN ASSESSMENT OF PRESENT KNOWLEDGE.
Bristorl Univ. (England).; and University Coll. of Swansea (Wales); and Institute of Coastal Oceanography and Tides Birkenhead (England); and Institute for Marine Environmental Research, Edinburgh (Scotland).
For primary bibliographic entry see Field 2L.
W78-06530

SHIPBOARD OIL IN WATER MONITOR.
Nucor Corp., Denville, NJ.
For primary bibliographic entry see Field 5A.
W78-06531

MODELING OF OIL EVAPORATION IN AN AQUEOUS ENVIRONMENT (RESEARCH ON THE EFFECTS OF CRUDE OIL TRANSFER AND UPSTREAM REFINERIES ON DELAWARE BAY),
Delaware Univ., Newark. Dept. of Civil Engineering; and Delaware Univ., Newark. Coll. of Marine Studies.
H. Wang, W. C. Yang, and C. P. Huang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 968, Price codes: A03 in paper copy, A01 in microfiche. Report No CMS-RANN-5-76, Ocean Engineering Report No 7, December 1976. 48 p, 14 fig, 3 tab, 12 ref. NSF-GI-41896.

Descriptors: *Oil spills, *Evaporation, *Air temperature, *Wind velocity, *Computer programs, *Oil pollution, Mathematical models, Delaware, Weathering, *Outer Continental Shelf, *Oil weathering, Delaware Bay, Wind speed, Pollutant transport, Transfer processes, Crude oil, Refineries.

The goal of the overall research program is to provide information on the input of oil transfer operations in Delaware Bay for decision makers. The work reported here consists of the computer modeling of oil weathering in the early stage of a spill. A numerical model is developed to predict changes in oil characteristics, specific gravity, residues by weight and residues by volume of oil on water through evaporation known to dominate the early stage of weathering. The major driving forces for evaporation being considered include air temperature, wind speed, and size of slick. Laboratory experiments were conducted using No. 2 fuel oil, Nigerian Crude, and Venezuelan Crude to calibrate the numerical model and to gain physical insight into the oil evaporation process. Based on the laboratory results, empirical relationships are proposed for determining the diffusion coefficient described in the first-order decay formula. Both numerical and laboratory results seemed to indicate that the effect of temperature on oil weathering is significant in the very early stage of weathering, but diminishes at a later time. The effect of wind speed is more uniform throughout the time duration being tested. (Sinha-OEIS)
W78-06533

BIOLOGICAL OIL SLICKS. PART I - LITERATURE EXAMINATION,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 5B.
W78-06536

LECTURES ON ESTUARINE CIRCULATIONS AND MASS DISTRIBUTIONS,
Johns Hopkins Univ., Baltimore, MD. Dept. of Earth and Planetary Sciences; and Johns Hopkins Univ., Baltimore, MD. Dept. of Mechanics and Materials Sciences.
For primary bibliographic entry see Field 2L.
W78-06538

OIL SPILL AND OIL POLLUTION REPORTS NOVEMBER 1976 - JANUARY 1977,
California Univ., Santa Barbara. Marine Science Inst.
P. Melvin, H. Ehrenspeck, and P. Nordin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 248, Price codes: A14 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Research and Development, Environmental Protection Technology Series No EPA-600/2-77-075, April 1977. 303 p, append. Grant No R803992.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, *Water pollution effects, *Bibliographies, Pollution abatement, Environmental effects, Estuarine environment, Patents, *Outer Continental Shelf, Coastal zone, Ecological effects.

Oil Spill and Oil Pollution Reports is a quarterly bulletin designed to review current scientific and technical publications and research projects in the field of oil pollution. Subject coverage includes all aspects of aquatic and terrestrial oil pollution. This issue contains summaries of research projects and published information selected from the scientific and technical literature during the period November, 1976 through January, 1977. The following sections are included in the report: reports, publications, and patents; current research projects; and current oil-related conferences. (Sinha-OEIS)
W78-06539

OIL SPILL AND OIL POLLUTION REPORTS AUGUST 1976 - OCTOBER 1976,
California Univ., Santa Barbara. Marine Science Inst.
P. Melvin, H. Ehrenspeck, and P. Nordin.
Available from the National Technical Information Service, Springfield, Va., as PB-267 266, Price codes: A14 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Research and Development, Environmental Protection Technology Series No. EPA-600/2-77-037, February 1977. 317 p, append. Grant No. R803992.

Descriptors: *Oil spills, *Oil pollution, Water pollution sources, *Water pollution effects, *Bibliographies, Pollution abatement, Environmental effects, Estuarine environment, Patents, *Outer Continental Shelf, Coastal zone, Ecological effects.

Oil Spill and Oil Pollution Reports is a quarterly bulletin designed to review current scientific and technical publications and research projects in the field of oil pollution. Subject coverage includes all aspects of aquatic and terrestrial oil pollution. This issue contains summaries of research projects and publications selected from the scientific and technical literature during the period August, 1976 through October, 1976. The following sections are included in the report: reports, publications, and patents; current research projects; and current oil-related conferences. (Sinha - OEIS)
W78-06540

OIL SPILL AND OIL POLLUTION REPORTS MAY 1976 - JULY 1976,
California Univ., Santa Barbara. Marine Science Inst.
P. Melvin, and H. Ehrenspeck.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 870, Price codes: A16 in paper copy, A01 in microfiche Environmental Protection Agency, Office of Research and Development, Environmental Protection Technology Series No. EPA-600/2-76-266, October 1976. 357 p, append. Grant No. R803992.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, *Water pollution effects, *Bibliographies, Pollution abatement, Environmental effects, Estuarine environment, Patents, *Outer Continental Shelf, Coastal zone, Ecological effects.

Oil Spill and Oil Pollution Reports is a quarterly bulletin designed to review current scientific and technical publications and research projects in the field of oil pollution. Subject coverage includes ass aspects of aquatic and terrestial oil pollution. This issue contains summaries of research projects and documents selected from the scientific and technical literature during the period May, 1976 through July, 1976. The following sections are included in the report: reports, publications, and patents; current research projects; and current oil-related conferences. (Sinha - OEIS)
W78-06541

OIL SPILL AND OIL POLLUTION REPORTS MAY 1975 - JULY 1975,
California Univ., Santa Barbara. Marine Science Inst.
F. A. DeWitt, Jr., P. Melvin, and R. M. Ross.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 852, Price codes: A15 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Research and Development, Environmental Protection Technology Series No. EPA-600/2-76-129, July 1976. 329 p, append. Grant No R803063.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, *Water pollution effects, *Pollution abatement, Bibliographies, Environmental effects, Estuarine environment, Patents, *Outer Continental Shelf, Coastal zone, Ecological effects.

This report is one of a series on oil spills. It cites current events, literature, research patents, and other material relevant to oil pollution abatement and is published in an abstract format on a quarterly basis. As such, it servies as a reference document for those interested in oil spills and oil pollution control. These reports are part of the continuing program of the Oil & Hazardous Materials Spills Branch, IERL-CI, to assess the environmental impact of oil spills and to help in providing the methodologies and tools to prevent spills and to minimize their effects when they do occur. The sources of the bibliographic citations and summaries of articles presented are scientific, technical and abstract journals. A list of the periodicals reviewed is provided in the appendix. The summarized material is grouped according to subject and then arranged alphabetically by senior author within each subject division. (Sinha - OEIS)
W78-06545

PREDICTABILITY OF LNG VAPOR DISPERSION FROM CATASTROPHIC SPILLS ONTO WATER: AN ASSESSMENT,
Arkansas Univ., Fayetteville. Dept. of Chemical Engineering.
J. A. Havens.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 525, Price codes: A10 in paper copy, A01 in microfiche. Coast Guard Office of Merchant Marine Safety, Cargo and Hazardous Materials Division Report No. CG-M-09-77, April 1977. 113 p, 8 fig, 8 tab, 42 ref, 2 append.

Descriptors: *Mathematical models, *Natural gas, *Water pollution sources, Dispersion, Hazards, *Outer Continental Shelf, *Liquified natural gas, LNG spills, Vapor dispersion, Flammable gases, *Pollutant transport, Prediction models.

Mathematical models which have been used to predict the downwind travel of flammable gas mixtures in the event of a catastrophic spill of liquefied natural gas into water are reviewed. In the event of a catastrophic release it is considered highly likely that an immediate fire would ensue. However, in the event that ignition did not occur immediately, an LNG vapor cloud would form over and downwind of the spill site. Wide disagreement regarding the extent of travel (and the accompanying possible public exposure) of the flammable portion of such a cloud has contributed to an apparently growing concern regarding the risks asociated with LNG importation. The scope of this review was limited to the predictability of dispersion from a very large LNG spill on water. No consideration was given to site-specific factors such as topographical features and structures. Likewise, no consideration was given to specific applicability of weather conditions, since this would depend on the site involved as well as the traffic control measures which are imposed. (Sinha - OEIS)
W78-06546

PROCESSES, PROCEDURES AND METHODS FOR CONTROL OF POLLUTION FROM SALT WATER INTRUSION.
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 457, Price codes: A05 in paper copy, A01 in microfiche. Draft Report, 1973. 76 p, 11 fig.

Descriptors: *Estuaries, *Water pollution control, *Water pollution sources, Tidal effects, Pollution abatement, Institutional constraints, Legislation, Legal aspects, *Outer Continental Shelf, *Salt water intrusion, Pollutant transport, Transfer processes.

This report deals with the causal factors and pollutant movement associated with upstream encroachment of sea water and its environmental consequences. Control methods and monitoring procedures are presented together with selected references to sources for more detailed information. Upstream migration of the sea water wedge changes the salinity of aquatic environments and may render fish and wildlife habitats unsuitable for native populations. Sea water encroachment can contaminate human and agricultural water supplies necessitating costly treatment or relocation of intake points. Upstream migration of sea water is generally the result of man's alteration of the hydraulic equilibrium that exists between the fresh water and sea water regimes. The most common causes of sea water encroachment in streams are dredging of navigation channels, construction of sea level chanals, and reduction of stream flow. Any attempt to control an activity involving the diversion and use of surface or ground waters, in order to prevent water pollution, will involve vested water rights and usually will be in conflict with these water rights. Legal and institutional spects are considered. (Sinha - OEIS)
W78-06547

STANDARDS OF ENVIRONMENTAL QUALITY FOR RECREATIONAL EVALUATION OF RIVERS,
Northwestern Univ., Evanston, IL. Technological Inst.
For primary bibliographic entry see Field 6B.
W78-06553

A MODEL FOR ESTABLISHING WATER QUALITY STANDARDS FOR RIVERS,
Bureau of Land Management, Anchorage, AL.
For primary bibliographic entry see Field 6B.
W78-06558

A BRANCH AND BOUND METHOD FOR USE IN PLANNING REGIONAL WASTEWATER TREATMENT SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-06565

ESTABLISHING LOCAL WATER QUALITY MANAGEMENT PRIORITIES,
Washington Univ., St. Louis, MO. Dept. of Technology and Human Affairs.
W. P. Darby, F. C. McMichael, and R. W. Dunlap.
Journal of Environmental Systems, Vol 7, No 3, p 257-277, 1977-78. 3 fig, 7 tab, 12 ref.

Descriptors: *Water quality, *Water management(Applied), *Urban watersheds, *Methodology, Evaluation, Discriminant analysis, Mathematical models, Land use, Planning, Water resources development, Regulation, Systems analysis.

A methodology which can be implemented by water resources regulatory authorities to establish local water quality management priorities for

urban watersheds is presented. The model utilizes an approach to management which does not require extensive field sampling and investigation, but rather makes use of readily-available data. Indirect indicators of watershed characteristics and land use planning are used to predict overall water quality conditions of the watersheds. The methodology is applied to Allegheny County, Pennsylvania, a region which can be divided into eighty-two separate, independent drainage areas. Indirect indicators are used here to forecast the overall water quality of those watersheds for which no direct measurements exist, to single out problematic watersheds for possible regulatory action, and to identify those watersheds which should receive an in-depth study to characterize water quality conditions. This methodology is currently used by Allegheny County Health Department to establish implementation priorities for the small urban streams in the region. (Bell-Cornell)
W78-06573

STEADY-STATE DISSOLVED OXYGEN MODEL FOR THE RIDEAU RIVER,
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-06574

IMPACT OF COMMUNITY PLANNING ON QUALITY OF LIFE IN THE NORTH,
Canada Department of National Health and Welfare, Edmonton (Alberta). Medical Services.
J. Grainge.
Canadian Journal of Civil Engineering, Vol 4, No 4, p 436-444, December 1977. 4 fig.

Descriptors: *Water resources development, *Long-term planning, *Community planning, *Scandinavia, Environmental control, Short-term planning, Sanitary engineering, Human population, Water supply, Sewerage, Arctice Ocean, Water distribution(Applied), Solid wastes, Constraints, *Canada, *Canadian North.

Long-range planning is required in order to avoid impending environmental disasters in most northern communities. Present short range planning should consider more closely the basic needs of the inhabitants. These needs include piped water and sewer systems, more careful avoidance of sewage pollution of drinking water and the immediate environment, better cross cultural integration, greater emphasis on recreational facilities, awareness of the need for energy savings, less ice fogs, and relatively warm and sunny microclimates. The Scandinavians have been leaders in this field and offer many examples of advanced planning of northern communities in Lapland, Iceland, and West Greenland. We should study their approach towards the solution of our common problems. Through dialogue with them a clearer understanding and possibly better solutions to existing problems will be found. A basic necessity in making the studies is a better understanding of the nature of the North and of the people; we must learn to work with both nature and the people. It is now the time for long-range planning by considering climatic, environmental and cultural factors, and integrating them into a more harmonious system with the aim of a higher quality of life. (Bell-Cornell)
W78-06577

AN EVALUATION OF THE POTENTIAL FOR USING DRAINAGE CONTROL TO REDUCE NITRATE LOSS FROM AGRICULTURAL FIELDS TO SURFACE WATERS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
J. W. Gilliam, R. W. Skaggs, and S. B. Weed.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 575, Price codes: A06 in paper copy, A01 in microfiche. Water Resources Research Institute of the University of North Carolina, Raleigh, UNC-WRRI Rpt. No 128, Jan 1978. 108 p, 23 fig, 4 tab, 32 ref, 2 append. OWRT A-083-NC(2). 14-34-0001-7070.

Descriptors: *Drainage control, *Nitrates, Nitrogen, Agricultural soils, *Soil water movement, Surface waters, Denitrification, Agricultural runoff, Soil drainage, Coastal plain soils, *North Carolina.

This study was an outgrowth of previous work which revealed that considerable denitrification occurred in poorly drained soils with high water tables. This resulted in less nitrate leaving fields in drainage waters than occurred in better drained soils. Two N.C. Coastal Plain sites were used: one in the poorly drained soils of the Tidewater area and the other in the moderately well drained soils of the Lower Coastal Plains. Flashboard riser type water control structures were installed in four main tile lines at each location. Each control structure was equipped with a weir and a stage recorder for computing total outflow of drainage water. A semi-proportional water sampler was installed at each weir to take samples for chemical analyses. The structures were very effective in controlling the loss of nitrate-nitrogen on the moderately well drained soils. The annual loss of nitrate-nitrogen under controlled conditions was 1-7 kg/ha as compared to the 25-40 kg/ha under uncontrolled conditions. This reduction is due entirely to prevention of water movement through the tile lines, however, and there is no indication that the water control resulted in the anticipated increased denitrification in the fields. Water table control on the poorly drained soils was much more successful. By controlling and maintaining the water table at higher levels, no significant difference in oxidation-reduction potential throughout the soil profile was observed. Also, there was no significant change in the nitrogen concentration in water leaving the fields in the drainage ditches under controlled and uncontrolled conditions. (Kiger-No Car St)
W78-06578

IMPACT OF POTENTIAL PHOSPHATE MINING ON THE HYDROLOGY OF OSCEOLA NATIONAL FOREST, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06590

WATER MANAGEMENT EFFECT OF THE PLZEN SULFITE PULP MILL SHUTDOWN (VODOHOSPODARSKY EFEKT LIKVIDACE SULFITOVE CELULOZKY V PLZNI),
Zapadoceske Papirny, Pilsen (Czechoslovakia).
J. Hroch.
Papir a Celuloza, Vol. 32, No. 7-8, p 211-212, 1977. 3 tab.

Descriptors: *Sulfite liquors, *Pulp wastes, *Water pollution effects, Wastes, Industrial wastes, Pulp and paper industry, Effluents, Water pollution sources, Foreign countries, Europe, Water quality, Dissolved oxygen, Biochemical oxygen demand, Chemical oxygen demand, Pollution abatement, Saturation, Czechoslovakia, Radbuza river(Czechoslovakia), Sulfite pulp mills.

In March 1975, the Plzen sulfite pulp mill was shut down, and the effect of this measure on the effluent-receiving waters was studied in 1976 after a new equilibrium was established. The mill is located on the Radbuza river with 355 and 364-day flows of 1.93 and 1.18 cu m/sec, respectively. River water above and below the mill was analyzed for 16 parameters before and after the shutdown. The comparison showed that a significant improvement in water quality resulted from the shutdown. For example, the dissolved oxygen level below the mill increased from 2.1 to 10.1 mg/liter and the saturation from 17 to 83%. At the same time the 5-day BOD decreased from 86.3 to 5.2 mg/liter and the COD from 115 to 9 mg/liter. (Trubacek-IPC)
W78-06630

USE OF WARM WATER AFTER COOLING COMPRESSORS AND CONDENSERS (ISPOL'ZOVANIE V PROIZVODSTVE TEPLOI VODY POSLE OKHLAZHDENIYA KOMPRESSOROV I KHOLODIL'NIKOV),
Solikamskii Tsellyulozno-Bumazhnyi Kombinat (USSR).
For primary bibliographic entry see Field 3C.
W78-06638

PEATLAND AND WATER IN THE NORTHERN LAKE STATES,
North Central Forest Experiment Station, St. Paul, MN.
For primary bibliographic entry see Field 4D.
W78-06639

GEOTHERMAL POWER SYSTEM,
For primary bibliographic entry see Field 8G.
W78-06659

WATER PURIFICATION METHODS,
ITT Corp., Nutley, NJ. (Assignee).
E. W. Sawyer, Jr.
U.S. Patent No. 4,054,515, 9 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 963, No 3, p 992, October 18, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Water pollution treatment, *Pollutants, Adsorption, Clays, Clay minerals, Filtration, Toxins, Attapulgite, Sepiolite.

Treating water with certain minerals removes substances which do not respond to other methods of water purification. One method comprises the use of attapulgite clay powder in combination with alum for treating potable water. Substances such as pesticides, toxins, harmones, heavy metal cations and viruses are removed from water by adsorption upon the clay surface. When contacting is employed, the clay containing the adsorbed substances is subsequently removed by sedimentation or filtration. The clays can be regenerated by appropriate chemical or thermal techniques. (Sinha-OEIS)
W78-06662

OIL SKIMMING APPARATUS,
C. F. Propp.
U.S. Patent No. 4,054,525, 13 p, 15 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 963, No 3, p 995-996, October 18, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water quality control, Water pollution treatment, Separation techniques, Floating, Skimming, Equipment.

An apparatus for removing oil from the surface of water has a sump in which a pump is provided for removing the oil and water mixture. The sump has a front inlet associated with a float and a connecting flexible apron directing the oil and water mixture from the float to the sump. The apron allows the float to move vertically and to pivot longitudinally and laterally so that the float can maintain a uniform feeding position independent of the main vessel. The float is placed in a front opening of the vessel for compactness and for directing oil into the inlet means. The apparatus is designed so that it will pick up debris with the oil and water mixture without plugging up. (Sinha-OEIS)
W78-06667

APPARATUS AND METHOD FOR REMOVING FINE PARTICLES FROM A LIQUID MEDIUM BY ULTRASONIC WAVES,
A. Porath-Furedi.

U.S. Patent No. 4,055,491, 5 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 963, No 4, p 1323, October 25, 1977.

Descriptors: *Patents, *Water treatment, *Separation techniques, *Water quality control, *Ultrasonics, Sound waves, Flocculation, Algae, Water quality.

An apparatus and method are described for using ultrasonic waves for removing microscopic particles from a liquid medium, such as algae from a solar or refuse pond. The described apparatus includes an ultrasonic generator propagating ultrasonic waves of over one megacycle per second through the liquid medium to cause the flocculation of the microscopic particles at spaced points. The ultrasonic waves are propagated in the horizontal direction and baffle plates are placed below the level of propagation. The baffles are oriented to provide a high resistance to the horizontal propagation and a low-resistance to the vertical settling of the flocculated particles. The ultrasonic generator is periodically energized to flocculate the particles, and then de-energized to permit the settling of the particles through the baffle plates where they are removed. (Sinha-OEIS)
W78-06672

OIL RECOVERY APPARATUS,
National Research Development Corp., London (England). (Assignee).
R. G. Teasdale.
U.S. Patent No. 4,056,472, 15 p, 8 fig, 16 ref; Official Gazette of the United States Patent Office, Vol 964, No 1, p 214, November 1 1977.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water quality control, Water pollution treatment, Skimming, Floats, Weirs, Equipment, *Oil recovery.

The invention relates to a method and apparatus for concentrating a relatively large surface area thin film of oil into a relatively small surface area thick narrow layer of oil and subsequently recovery the oil layer. Oil is allowed to pass over the leading weir edge of an oil skimmer mounted transversely across a flotation platform. The leading weir edge is positioned in the region of the center of buoyancy of the flotation platform. Oil passing over the leading weir edge is sucked through a slotted flow equalizing baffle plate mounted within the oil skimmer and removed to a collection location or vessel. (Sinha-OEIS)
W78-06677

ESTIMATING AN EFFLUENT CHARGE: THE RESERVE MINING CASE,
Minnesota Univ., Minneapolis. Dept. of Economics.
J. M. Peterson.
Land Economics, Vol. 5, No. 3, p 328-341, August 1977. 3 tab, 39 ref, 1 append.

Descriptors: *Effluents, *Reserve Mining Corporation, *Lake Superior, *Taconite, Water pollution effects, *Pollution taxes(Charges), Regulation, Judicial decisions, Mine wastes, Asbestos, Minnesota, Silver Bay(MN), Great Lakes, Water pollution sources, Water pollution control, Human disease, Economics, Costs, Social costs, Pollutants, Eutrophication, Public health.

Social costs incurred by the Reserve Mining Corporation's discharge of asbestos containing taconite tailings into Lake Superior at Silver Bay, Minnesota, are estimated to determine an equitable effluent charge. A 1974 court action attempted to force the company to alter its discharge procedures; this paper offers an alternative abatement strategy in which an effluent charge is imposed to cover annual social costs of the pollution. Revenues generated can be used to reduce pollution and treat cancer victims, as well as to constitute an incentive to Reserve to find discharge methods carrying lower social costs. Annual cost estimates include: (1) lake eutrophication ($3,837,000), (2) water filtration ($1,365,000), (3) health hazard ($532,000), (4) residual costs due to the permanence of the tailings in the lake ($584,000). A simple per-ton charge would be $.30 on the 20,888,000 tons of tailings discharged annually, or $6,318,000 per year. A more sophisticated levy would be $3.89/ton for coarse tailings (about 50% of total weight, but which account for only 6.4% of social costs and surface area) and $.55/ton for fine tailings (50% of the weight, 93.6% of social costs and surface area). Pollution of Lake Superior by the tailings appears to be causing rapid eutrophication, killing aquatic life, reducing asthetic beauty, and seriously damaging tourism. Contamination by asbestos-form fibers, a known carcinogen, may cause 274 deaths per year among North Shore residents. (Lynch-Wisconsin)
W78-06682

THE FRESH AIR--CLEAN WATER EXCHANGE,
H. F. Bormann, and G. E. Likens.
Natural History, Vol. 86, No. 9, p 63-64, 68, 70-71, November 1977.

Descriptors: *Forest watersheds, *Ecosystems, *Water pollution control, *Rainfall, *Water supply, Forests, Solar radiation, Pollution abatement, Air pollution, New Hampshire, Small watersheds, Precipitation(Atmospheric), Nutrients, Streams, Percolating water, Water pollution effects, Air pollution effects, Acidity, Pollutants, Urbanization, Forest soils, Air-water interfaces.

Studies of small New Hampshire forest watersheds (30-100 acres) show they provide very important pollutant-removal benefits to humans, all powered by solar energy; but forest vegetation and soils eventually come into equilibrium with pollution loads, lose their storage function, and the ecosystem may be damaged. Forests modify streamflow and erosion, filter air and water, release sediment-free water to underground and surface water supplies, and moderate temperature and humidity. Large quantities of nutrients move about freely between vegetation and soil, but little is lost in drainage water, and such losses are made up by rock weathering. A forest regulates the chemical quality of water percolating through it into streams or to groundwater. Nitrate present in increasing amounts in rainfall is mostly being held within the forest ecosystem. Because of increasing use of fossil fuels, rainfall in the northeastern United States is now largely a mixture of water and sulfuric and nitric acids. The forest ecosystem removes much of this acid from rainwater, so that stream water draining from the watersheds is 30 times less acid than rainwater. Natural soils remove heavy metals, some radioactive isotopes, and pesticides. Soil and forest vegetation also remove many particulate and gaseous pollutants from the air; vegetation is especially efficient in removing sulfur from the air, and forest soil absorbs large amounts of carbon monoxide. (Lynch-Wisconsin)
W78-06693

PREIMPOUNDMENT STUDY: CEDAR CREEK DRAINAGE BASIN: EVANS COUNTY WATERSHED: EVANS, TATTNALL, AND CANDLER COUNTIES, GEORGIA,
Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W78-06695

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

ENERGY RELATED ACTIVITIES AND AN ASSESSMENT OF THE WATER RESOURCE MANAGEMENT ALTERNATIVES IN SOUTH LOUISIANA,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 6B.
W78-06201

OPTIMIZATION OF A REGIONAL WATER RESOURCE QUALITY MANAGEMENT SYSTEM,
California Univ., Berkeley.
For primary bibliographic entry see Field 5G.
W78-06234

A MODEL FOR MULTI-PERIOD REGIONAL WASTEWATER PLANNING,
North Carolina Univ. at Chapel Hill.
For primary bibliographic entry see Field 5G.
W78-06299

DEVELOPMENT AND IMPLEMENTATION OF A REGIONAL WATER PLANNING DATA MANAGEMENT SYSTEM,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
A. B. Whinston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 174, Price codes: A10 in paper copy, A01 in microfiche. Technical Report No. 97, January 1978. 191 p, 39 fig, 86 ref. OWRT B-080-IND(9).

Descriptors: *Data processing, *Data storage and retrieval, *Decision making, Data collections, Computer models, Data transmission, Information exchange, *Planning, Information retrieval, Regional analysis, *Data management, *Water quality data, *GPLAN, CODASYL, Query processor.

The work is an extension to the Generalized Planning (GPLAN) System developed at Purdue University. The approach was to integrate techniques from the field of data base management with artificial intelligence techniques and concepts, culminating in an intelligent decision support system. The report commences with a survey of the emergency discipline of decision support systems. An example of a water quality mananagement application is given within the GPLAN framework. Several extensions and corrections for the CODASYL approach to data management are given. There is an investigation of problems encountered in the management of water quality data that is logically distributed. A generalized mapping language is proposed as a mechanism for information transferral within a distributed data base, and a general data structure for supporting the mapping function is illustrated. The presented method accommodates a variety of user views, is independent of whether the data base is geographically distributed or centralized, furnishes a straightforward security mechanism and provides a basis for treating the contingency of uninformed or non-programming users.
W78-06360

MATHEMATICAL MODELING AND ECONOMIC OPTIMIZATION OF WASTEWATER TREATMENT PLANTS,
Louvain Univ. (Belgium). Dept. of Engineering.
For primary bibliographic entry see Field 5D.
W78-06415

ECONOMIC EVALUATION OF ALTERNATIVE USES OF RIVERS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 6B.
W78-06552

SIMULATION MODELING AS A TOOL FOR MANAGING RIVER RECREATION,
Montana Univ., Missoula. School of Forestry.
For primary bibliographic entry see Field 6B.
W78-06555

A MARKOV-BASED LINEAR PROGRAMMING MODEL OF TRAVEL IN THE BOUNDARY WATERS CANOE AREA,
Northwestern Univ., Evanston, IL. Technological Inst.
For primary bibliographic entry see Field 6B.
W78-06556

A MODEL FOR ESTABLISHING WATER QUALITY STANDARDS FOR RIVERS,
Bureau of Land Management, Anchorage, AL.
For primary bibliographic entry see Field 6B.
W78-06558

OPTIMAL DESIGN OF WATER DISTRIBUTION NETWORKS,
Rome Univ. (Italy). Ist. di Aerodinamica.
For primary bibliographic entry see Field 4A.
W78-06562

MANAGING WILDERNESS TRAVEL: A MARKOV-BASED LINEAR PROGRAMMING MODEL,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
J. S. deBettencourt, G. L. Peterson, and P. K. Wang.
Environment and Planning A, Vol. 10, No. 1, p 71-79, 1978. 8 ref.

Descriptors: *Wilderness, *Management, *Markov processes, *Linear programming, *Mathematical models, *Watercraft travel, Canoeing, Constraints, Planning, Programs, Control, Optimization, Recreation, Quotas, Daily, Entry points, Traveler maximization, Model validity, Travel system, Analytical techniques, Equations, Systems analysis.

Overnight travel by watercraft in the Boundary Waters Canoe Area of Minnesota is described as a discrete parameter Markov chain. A simple normative model is constructed of the system as a steady state process in terms of constant daily entry rates and expected daily populations in interior zones. By means of linear programming and given constraints on entry rates and zone average daily populations, optimal entry quotas are determined for each of thirty-three entry points. The quotas thus derived have provided the basis for an actual control program implemented in 1976. Information pertaining to the validity of the application is presented and the use of the model in policy formation is described. (Bell-Cornell)
W78-06564

A BRANCH AND BOUND METHOD FOR USE IN PLANNING REGIONAL WASTEWATER TREATMENT SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-06565

A STOCHASTIC MODEL OF THE OPERATION OF A STREAM-AQUIFER SYSTEM,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 4A.
W78-06566

STRUCTURAL FLOOD CONTROL PLANNING,
Bell Lab., Holmdel, NJ.
For primary bibliographic entry see Field 4A.
W78-06567

ON LEVEL CROSSINGS AND CYCLES IN DAM PROCESSES,
Utrecht Rijksuniversiteit (Netherlands). Mathematical Inst.
For primary bibliographic entry see Field 8B.
W78-06569

LAND DATA MANAGEMENT SYSTEM FOR RESOURCE PLANNING,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 4A.
W78-06570

ESTABLISHING LOCAL WATER QUALITY MANAGEMENT PRIORITIES,
Washington Univ., St. Louis, MO. Dept. of Technology and Human Affairs.
For primary bibliographic entry see Field 5G.
W78-06573

A SIMULATION MODEL FOR SCREENING A SYSTEM OF RESERVOIRS FOR ENVIRONMENTAL IMPACT,
MacLaren (James F.) Ltd., Willowdale (Ontario). Water Resources Group.
For primary bibliographic entry see Field 4A.
W78-06576

IMPACT OF COMMUNITY PLANNING ON QUALITY OF LIFE IN THE NORTH,
Canada Department of National Health and Welfare, Edmonton (Alberta). Medical Services.
For primary bibliographic entry see Field 5G.
W78-06577

6B. Evaluation Process

ENERGY RELATED ACTIVITIES AND AN ASSESSMENT OF THE WATER RESOURCE MANAGEMENT ALTERNATIVES IN SOUTH LOUISIANA,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
C. A. Whitehurst, and R. A. Kinney.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 868, Price codes: A09 in paper copy, A01 in microfiche. Completion Report, December 1976. 270 p, 53 fig, 33 tab, 12 ref, 8 append. OWRT C-6052(5204)(1). 14-31-0001-5204.

Descriptors: *Land use, Water resources, Management, *Alternative planning, *Louisiana, *Evaluation, Industries, *Oil and gas industry, *Barataria Basin(LA), *Model studies, *Regional analysis, Water quality, *Environmental effects, Drainage, Water pollution, Estuarine environment.

Results are presented of a study of water resource management problems which are related to oil and gas industrial activities in the upper regions of the Barataria Basin of South Louisiana. The project area is of major importance as a source for nutrients feeding the Barataria estuary, for its timber stand and because of agricultural usage. The study includes the utilization of assessment models of the region's environmental regimes and a measure of the expected impact of several historically significant energy-related activities on the water resources. The assessment model used in this study (SUITABILITY ANALYSIS) was a powerful tool in determining the state of the environment. Baseline data were generated including biological and botanical indices, distributions of soil classes, a water balance investigation, water quality measurements and a wildlife inventory. Land-use and water vector maps were prepared and estimates were made of the productivity of the region. The project region is one wherein land use is shared by natural vegetation and water but with areas of intense human activity. The influence of human activity is most obviously reflected in the water quality of the region and in the disruption of natural drainage which has resulted in the impoundment of natural areas and the enhancement of land-use changes. Recommendations were made for the establishment of a master land-use plan for the area in order to insure sensible (environmentally) land-use alterations. In the absence of such a plan, every effort should be made to control further disruption of the drainage system and discourage conversion of natural areas into agricultural lands.
W78-06201

PUERTO RICO'S WATER RESOURCES PROBLEMS AND RESEARCH NEEDS.
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.; and Department of Natural Resources, San Juan (Puerto Rico).
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 100, Price codes: A01 in paper copy, A01 in microfiche. Research Report, February, 1974. Proceedings of Conference and Planning Session, R. Vazquez, Ed. 88 p, 1 append. OWRT A-999-PR(2).

Descriptors: *Water resources, *Water resources development, *Puerto Rico, Soils, Crop production, Industries, Water quality, Water conservation, Water demand, Water supply, Environment, Environmental effects, Economics, Water control.

The proceedings of a conference and planning session to identify Puerto Rico's water resources problems and research needs are presented. Panel discussions were conducted on water for agriculture, water for development, water for industry, and on water and environmental quality R and D efforts. The agricultural discussion centered on water resource needs for sugar production and on Federal soil and water conservation programs. Economics, flood control, domestic water use problems and research needs, and Corps of Engineers water resources programs were discussed with regard to development. Concerning industrial development, water use problems and research needs for industry and water resource planning were treated. The panel on water and environmental quality discussed water quality problems and research needs, EPA water resources programs, USGS water resources research, and water resources in the Virgin Islands. (Wares-IPA)
W78-06206

ANALYSIS OF PRIORITY WATER RESOURCES PROBLEMS FOR THE SOUTHERN PLAINS REGION,
Arkansas Univ., Fayetteville. Water Resources Research Center.
R. E. Babcock, G. Carruthers, E. J. Dantin, M. T. Edmison, and W. L. Powers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 235, Price codes: A04 in paper copy, A01 in microfiche. Final Report, September, 1977. 46 p, 13 tab. OWRT B-214-TEX(1). 14-34-0001-7204.

Descriptors: *Water resources, *Research priorities, *Planning, *Arkansas, *Kansas, *Louisiana, *Oklahoma, *New Mexico, *Texas, Groundwater, Pollutant identification. Land subsidence, Recharge, Reservoirs, Water supply, Wells, Management, Southern plains US, Resource problem areas.

tate water resources research institutes in the Southern Plains River Basin Region of the U.S. (Arkansas, Kansas, Louisiana, New Mexico, Oklahoma, and Texas) have identified their critical and serious water resources problems and research needs; funding is outlined through fiscal year 1978. Problems in Arkansas were identified as groundwater quality/recharge, lake/reservoir quality degradation, urban land development impacts, river management, economics and water use coefficients, and pollutant identification. In Kansas, improving water use efficiency, water allocation/management, and in-stream use and water quality were stressed. Problems in Louisiana include contingency planning, deep well waste disposal, aquifer management, waste water treatment, aquifer heat storage, clay minerals, leachates, subsidence, artificial recharge, and radionuclides. New Mexico problem areas include precipitation management, groundwater, Indian water rights, and economic development using saline water. Water quantity/quality, environmental impact, and water planning/management are the focus in Oklahoma, and in Texas, flood plain management, subsidence from aquifer drawdown, groundwater depletion/recharge, irrigation efficiency, seasonal water supply deficiency, interbasin transfer, groundwater quality protection, surface water pollution by brines, lake/reservoir quality degradation, fresh water inflow to bays/estuaries, regional management institutions, and energy cost and groundwater pumpage, require major attention. (Wares-IPA)
W78-06207

FACING THE LONGTERM: AN INQUIRY INTO OPPORTUNITIES TO IMPROVE THE CLIMATE FOR RESEARCH WITH REFERENCE TO LIMNOLOGY IN CANADA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 6E.
W78-06217

INCOME ESTIMATES AND REASONABLE RETURNS IN ALASKA'S SALMON FISHERIES,
Cornell Univ., Ithaca, NY. Law School.
L. E. Owers.
Fishery Bulletin, Vol. 75, No. 3, p 483-492, 1977. 1 fig, 7 tab, 5 ref.

Descriptors: *Alaska, *Fisheries, *Salmon, *Income analysis, *Return(Monetary), *Commercial fishing, Resource allocation, Sport fishing, Limited entry, Permits, Regulation, Cost analysis, Nets, Trolling, Fish management, Economics, Equations, Profit.

Economic analysis of commercial salmon fishing in Alaska indicates that while in certain purse seine and drift gill net fisheries restricting or reducing the number of operating units would raise earnings to levels comparable with other sectors of the Alaskan economy, such measures would be inadequate in other fisheries, particularly in the set net and power troll fisheries. In several areas sport fishing is in direct competition with commercial fisheries, and resource allocation is a major problem. This paper examines a method for estimating the number of units that will provide a reasonable economic return in a fishery; three criteria are developed for determining reasonable return rate: (1) comparison with wages in other sectors, (2) comparison with total annual incomes from all sources and total incomes of workers in ... occupations, and (3) estimates by fishermen. Data show that in 1973, 60% of set gill netters, 44% of purse seiners, and 15% of drift gill netters in Alaska registered a net financial loss. In that year average net return to each of the more than 6400 gear operators was about $1600. The first comprehensive limited-entry law in the United States was passed by the Alaska legislature in 1973. Tables present input data used to generate income estimates by fishery, expected earnings at 5% permit reduction increments, and recommended permit levels. (Lynch-Wisconsin)
W78-06328

INTEGRATION OF WATER SUPPLY STRATEGIES IN A DESERT AREA,
California State Dept. of Water Resources, Sacramento. Div. of Planning.
J. L. Welsh.
In: Proceedings, United Nations Institute for Training and Research Conference on Alternative Strategies for Desert Development and Management, 31 May-10 June, 1977, Sacramento, California, Vol. 4, p. 1-7.

Descriptors: *Long-term planning, *California, Water resources development, Water management, Water allocation(Policy), *Water supply, Planning, Semiarid climates, Social needs, California water plan.

The need for a fully integrated, flexible and continually evolving water supply strategy and master plan is demonstrated. A brief summary of the California Water Plan is presented. The plan demonstrates that one broad master plan can accommodate and facilitate water development by several different governmental and private agencies. First published in 1957, the plan has demonstrated sufficient flexibility to accommodate the redirection of social goals and perceptions of resource limitations. It was pointed out that the plan may well serve as a guide to development in other arid and semi-arid parts of the world. (Castricone-Arizona)
W78-06342

THE REDISTRIBUTIONAL CONSEQUENCES OF PUBLIC RECREATION PROVISION AT THE POTHOLES RESERVOIR - COLUMBIA BASIN PROJECT, WASHINGTON,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
K. C. Scott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 295, Price codes: A07 in paper copy, A01 in microfiche. Completion Report, June, 1975. 143 p, 6 fig, 45 tab, 73 ref, 2 append. OWRT A-066-WASH(1), 14-31-0001-5048.

Descriptors: *Recreation, *Recreation facilities, *Washington, Reservoirs, Economics, Public benefits, Public access, Surveys, Costs, Cost-benefit analysis, Water resources development, Income distribution, Geographical regions, Reservoir operation, Reservoir design, *Columbia River, *Potholes Reservoir(WA), Redistributional impacts, Use patterns, Recreation programs, Reservoir management.

The redistributional consequences of public recreation provision were ascertained at the Potholes Reservoir on the basis of income class, geographical area, age group, and family status of the beneficiaries and cost bearers. The reservoir, originally constructed for irrigation purposes, is a small storage unit within the Columbia Basin Project and is used extensively for recreation. Funds for recreational facilities and for annual operation and maintenance costs have been provided by State and local governments. Benefits identified were assigned to relevant socioeconomic classifications of recreationists based on the results of a recreation survey (2,650 recreational interviewees). Estimated public costs of providing and maintaining outdoor recreation opportunity there were obtained from administering Federal and State agencies. Finally, these public costs were assigned to income classes and to geographical areas and age groups according to the estimated tax incidence effects of the public sector in the state. Recreationists receiving positive redistributional impacts were the lower income classes ($0-7,500), the young (under 25), the elderly (over 55), and recreationists residing in geographical areas adjacent to the reservoir area. Redistributional impacts of public recreation in the study area appeared to conform to the stated policy of water resource development, namely, assisting residents (including elderly and poor) in a local area. The appendices contain the interview form and tables of survey results. (Wares-IPA)
W78-06349

DEVELOPMENT AND IMPLEMENTATION OF A REGIONAL WATER PLANNING DATA MANAGEMENT SYSTEM,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W78-06360

EDUCATION OF WATER RESOURCES PLANNERS AND MANAGERS FOR EFFECTIVE PUBLIC PARTICIPATION.
Clemson Univ., SC. Water Resources Research Inst.
Available from the National Technical Information Service, Springfield, VA, 22161 as PB-280 243, Price codes: A09 in paper copy, A01 in microfiche. Publication Report No. 71, February, 1978, 192 p, 75 ref. Albert, Harold E. (ed.). OWRT A-999-SC(7).

Descriptors: *Public participation, State governments, Industrial development, Administrative agencies, South Carolina, Corps of Engineers, *Interest groups, *Management, *Water resources development, *Social partcipitation, *Planning, Attitudes, *Social values, Bibliographies, *Education, Personnel, *Alternative planning, Lake Hartwell, Georgia.

Water resources development should provide measures and facilities which are responsive to the long-run needs and evolving preferences of the public. An important means of achieving this goal is effective participation in water resources planning and management. In order to achieve this, key representatives of the diverse interest groups and of the public must be sufficiently familiar with both the obvious and the subtle dimensions of public participation, and must be aware of objectives as well as alternative approaches to the process. Participants at this symposium included representatives from federal, state, and local government agencies, and from private interest groups. The conclusions reached by this panel were: (1) The public must be divided into publics and having the right publics involved in the planning stage is crucial to the development stage; (2) The right publics must be involved as early as the pre-planning stage, although all of the publics who eventually will be involved need not be at the same time; (3) There are a variety of techniques for public involvement and no single technique is adequate for all projects. A case study was analyzed by leading participants from both the public and private sector, and this substantiated the accuracy of the above conclusions. In addition to the symposium, an extensive bibliography was compiled and annotated, and is included.
W78-06363

PROJECTIONS OF ECONOMIC DEVELOPMENT ASSOCIATED WITH COAL-RELATED ACTIVITY IN MONTANA,
Montana State Univ., Missoula. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6D.
W78-06364

RESEARCH IN ACTION: TECHNOLOGY FOR IMPLEMENTING WATER RESEARCH RESULTS. PROCEEDINGS OF A CONFERENCE, DECEMBER 5 - 6, 1974, LINCOLN, NEBRASKA.
Nebraska Univ., Lincoln. Water Resources Center.
For primary bibliographic entry see Field 10D.
W78-06370

WATER REQUIREMENTS FOR FUTURE ENERGY DEVELOPMENT IN THE WEST: STATE PERSPECTIVES,
EG and G Idaho, Inc., Idaho Falls.
For primary bibliographic entry see Field 6D.
W78-06375

CATALOG OF WATER RESOURCES RESEARCH IN ILLINOIS.
Illinois Univ. at Urbana-Champaign. Water Resources Center.
For primary bibliographic entry see Field 9A.
W78-06412

ECONOMIC EVALUATION OF ALTERNATIVE USES OF RIVERS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
D. A. King.
In: Proceedings: River Recreation Management and Research Symposium, January 1977, Minneapolis, Minnesota. USDA Forest Service General Technical Report NC-28, North Central Forest Experiment Station, Forest Service, Department of Agriculture, St. Paul, Minn., p 60-66, 1977. 3 fig.

Descriptors: *Cost-benefit analysis, *Recreation, *Rivers, *Opportunity costs, Management, Decision criterion, Hotelling-Clawson-Knetch model, Amenity values, User benefits, Net social benefits, Benefit maximization, Measurement, Mathematical models, Systems analysis.

The benefit-cost analysis decision criterion and the concept of opportunity cost are reviewed. Outlined is how to measure recreational benefits using the Hotelling-Clawson-Knetsch model. Discussed also are data and research needs for using benefit-cost analysis as a tool for making recreational river management decisions. It is concluded that the state-of-the-knowledge regarding measurement of recreational user benefits is such that it is now possible to measure them with confidence. The total willingness-to-pay measure of value, the area under the demand curve for the environment, is the relevant measure, given maximization of net social benefits as the decision criterion. This measure of value is constrained by income and is, therefore, a lower bound value. (Bell-Cornell)
W78-06552

STANDARDS OF ENVIRONMENTAL QUALITY FOR RECREATIONAL EVALUATION OF RIVERS,
Northwestern Univ., Evanston, IL. Technological Inst.
J. S. deBettencourt, and G. L. Peterson.
In: Proceedings: River Recreation Management and Research Symposium, January 24-27, 1977, Minneapolis, Minnesota. USDA Forest Service General Technical Report NC-28, North Central Forest Experiment Station, Forest Service, Department of Agriculture, St. Paul, Minn. p 245-255. 8 fig.

Descriptors: *Standards, *Recreation, *Environmental control, *Rivers, *Evaluation, Analytical techniques, Water quality standards, Equations, Model studies, Systems analysis, Economics, Environmental effects, Wilderness areas, Urban areas.

Presented is a utility theory of behavior in the form of the rational model of choice, for evaluating recreational sites. Explored is the possibility of developing evaluative criteria and standards based on the individual and group threshold functions by which alternative sites are accepted or rejected. The experimental procedures used to develop the threshold functions are explained and illustrative results of pilot studies are presented. Focused upon are the environmental characteristics or attributes of recreational sites on rivers. Discriminant analysis, used under three different variable transformations--linear, quadric, and dummy variable--, is shown as a powerful tool for estimating the individual threshold function. The condition of the water is considered on a scale of polluted to clean, in wilderness as well as urban areas. Scale definitions include: water condition, degree of development, crowding/use, trash/litter, and skill level required. It is concluded that the formulation of user-based criteria and standards for evaluation of recreational facilities is an important part of the planning, design, and management of recreational environments. The techniques discussed show considerable promise if they can be adequately defined, developed, and validated. Potential applications and needs for further research are discussed. (Bell-Cornell)
W78-06553

A SURVEY AND ANALYSIS OF RECREATIONAL AND LIVESTOCK IMPACT ON THE RIPARIAN ZONE OF THE RIO GRANDE IN BIG BEND NATIONAL PARK,
Texas Agricultural Experiment Station, College Station.
R. B. Ditton, D. J. Schmidly, W. J. Boeer, and A. R. Graefe.
In: Proceedings: River Recreation Management and Research Symposium, January 1977, Minneapolis, Minnesota. USDA Forest Service General Technical Report NC-28, North Central Forest Experiment Station, Forest Service, Department of Agriculture, St. Paul, Minn., p 256-266, 1977. 4 fig, 3 tab.

Descriptors: *Recreation, *Rivers, *Livestock, *Impact analysis, *Rio Grande(Tex), *Riparian sites, Management, Visitors, User patterns, Cluster analysis, Principal components analysis, Water resources, *Big Bend National Park(Tex), Ecology, Biological conditions, Systems analysis, *Texas.

The Rio Grande of the Big Bend National Park (Texas) has experienced dramatic increases in recreational and water use. The National Park Service has thus found it necessary to secure information concerning the actual and potential impact on the river and on associated land area ecosystems from present levels of human usage. Visitor usage patterns, biological conditions, and selected parameters of recreational impact (including litter, trampling, tree cutting, and human waste) were measured over a 12-month period. Use and impact were shown to be strongly and positively correlated. However, recreational impact was not significantly related to biological health of the area. Cluster analysis was used to group areas into three categories based on degree of impact; only one of every four sites was indicated as heavily impacted. Principal components analysis identified human impact parameters as best discriminators between sites.
W78-06554

SIMULATION MODELING AS A TOOL FOR MANAGING RIVER RECREATION,
Montana Univ., Missoula. School of Forestry.
S. F. McCool, D. W. Lime, and D. H. Anderson.
In: Proceedings: River Recreation Management and Research Symposium, January 1977, Minneapolis, Minnesota. USDA Forest Service General Technical Report NC-28, North Central Forest Experiment Station, Forest Service, Department of Agriculture, St. Paul, Minn., p 304-311, 1977. 1 fig, 2 tab.

Descriptors: *Simulation analysis, *Rivers, *Recreation, Management, Use patterns, Prediction, Visitor use limits, Campgrounds, Travel time, Travel routes, Information output, Mathematical models, Linear function, Planning, Systems analysis, *Utah, *Colorado, *Green River(Colo Utah), *Yampa River(Colo).

Accelerating use of free-flowing rivers for recreational floating has led many managers to initiate interim visitor use limits. Ideally, managers should know beforehand how use patterns and levels of solitude would be affected when use limits are implemented. The authors have modified the Wilderness Area Simulation Model, developed by Resources for the Future in cooperation with the USDA Forest Service, To predict patterns of river recreation use occurring under a variety of use conditions and have tested it on the Green and Yampa Rivers in Dinosaur National Monument for the week of June 23-29, 1975. The 'Base Case' simulation and actual patterns of use were compared to test the Simulator's validity and were found to be in close agreement. A variety of experiments, such as changing daily entry rates and opening and closing campgrounds, was simulated. (Bell-Cornell)
W78-06555

A MARKOV-BASED LINEAR PROGRAMMING MODEL OF TRAVEL IN THE BOUNDARY WATERS CANOE AREA,
Northwestern Univ., Evanston, IL. Technological Inst.
G. L. Peterson, J. S. deBettencourt, and P. K. Wang.
In: Proceedings: River Recreation Management and Research Symposium, January 24-27, 1977, Minneapolis, Minnesota. USDA Forest Service General Technical Report NC-28, North Central Forest Experiment Station, Forest Service, Department of Agriculture, St. Paul, Minn., p 342-350, 1977. 1 fig.

Descriptors: *Markov processes, *Linear programming, *Boundary waters, *Travel model, *Water travel, Canoes, Lakes, Systems analysis, Equations, Mathematical models, Probability, Management, Optimization, *Boundary Water Canoe Area(Minn Canada), *Minnesota, *Canada.

Described and illustrated is a Markov-based linear programming method used for predicting and analyzing travel in the Boundary Waters Canoe Area (BWCA) in order that management can control the rate of entry of travellers into the area. The Markov framework allows for the development of two distinctly different modes of analysis; forward-seeking and backward-seeking models. In the former, the manager specifies judgmentally the entry rates for each entry point. In the latter, the manager is asked to specify carrying capacities for each of the interior zones--and upper and lower limits for each of the entry points. Subject to constraints, the linear programming algorithm is used to maximize the total number of groups entering the BWCA; given are opportunity costs for each of the constraints. The travel model is formulated in terms of three different kinds of zones or states that a camper might occupy: entry, interior, and exit zones. Discussed is the validity of underlying assumptions; considered are: noninformational probabilities; nonstationary probabilities and entry rates; the heterogeneous population of travellers; monitoring of change; improvement of operational characteristics; and basic research. (Bell-Cornell)
W78-06556

CAMPSITE CHOICE BEHAVIOR IN THE RIVER SETTING: A PILOT STUDY ON THE ROGUE RIVER, OREGON,
Victoria Univ. (British Columbia). Dept. of Geography.
R. E. Pfister.
In: Proceedings: River Recreation Management and Research Symposium, January 24-27, 1977, Minneapolis, Minnesota. USDA Forest Service General Technical Report NC-28, North Central Forest Experiment Station, Forest Service, Department of Agriculture, St. Paul, Minn., p 351-358, 1977. 2 fig, 6 tab.

Descriptors: *Wild rivers, *Oregon, *Campsites, Regression analysis, Mathematical models, River terraces, Decision making, Camping parties, Systems analysis, *Rouge River(Ore).

The relation of campsite choice to the natural characteristics of campsites was analyzed along the Wild and Scenic Rouge River in Oregon. Two regression models--for commercial and noncommercial camping parties--were formulated relating campsite choice to 13 site characteristics of river terraces. Of the 5 significant variables selected for each model, 3 were the same: size of the campsite, size of the tributary providing potable water to the location, and a rating of beach area available for landing a boat. Stepwise multiple linear regression analysis was employed to test if significant relations exist between Party-nights and sit characteristics of the river terraces with camping occurring. (Bell-Cornell)
W78-06557

A MODEL FOR ESTABLISHING WATER QUALITY STANDARDS FOR RIVERS,
Bureau of Land Management, Anchorage, AL.
L. R. Waller, and D. R. McCurdy.
In: Proceedings: River Recreation Management and Research Symposium, January 24-27, 1977, Minneapolis, Minnesota. USDA Forest Service General Technical Report NC-28, North Central Forest Experiment Station, Forest Service, Department of Agriculture, St. Paul, Minn., p 380-385, 1977. 7 tab.

Descriptors: *Water quality standards, *Standards, *Rivers, Mathematical models, Costs, Recreation, Supply, Management, Decision making, Systems analysis.

An approach is presented for setting water quality standards for a river based on the following functional relation: R = f (Q, CQ, S, RC), where R = recreation activities (in number of units), Q = water quality level, CQ = cost of achieving or maintaining a specific water quality level, S = recreational supply of the resource, and RC = recreational consumption. The basic assumption is that the recreational use of a river is the most demanding of a high water quality compared to the other uses of the river. Types of decisions for which the model can be used as a basis are given; the usefulness of the model is discussed via two hypthetical situations. (Bell-Cornell)
W78-06558

MANAGING WILDERNESS TRAVEL: A MARKOV-BASED LINEAR PROGRAMMING MODEL,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-06564

QUANTITATIVE ASSESSMENT OF NATURAL VALUES IN BENEFIT-COST ANALYSIS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
R. Walker, and S. Bayley.
Journal of Environmental Systems, Vol 7, No 2, p 131-147, 1977-78. 1 fig, 3 tab, 19 ref.

Descriptors: *Ecosystems, *Cost-benefit analysis, *Environmental effects, *Assessment, *Economics, *Natural values, Flood plains, Highway effects, Methodology, Energy flows, Florida, Discount rates, Cost-benefit ratio, Water flow.

Two methods are presented of quantifying the contribution of natural ecosystems to man's economy in benefit-cost analysis. The economic approach uses dollar costs to approximate the more tangible natural system contributions. The energetic approach uses energy flows of the natural ecosystems to quantify the contributions. Sample calculations of each approach are made of the impact of a highway on a floodplain. It is found possible to integrate natural system value into an economic benefit-cost framework. Thus, for transportation planning, there is no longer a reason to disregard this type of externality in benefit-cost analysis. (Bell-Cornell)
W78-06572

EXTERNALITIES AND PROPERTY RIGHTS IN THE FISHERIES: COMMENT,
Environment and Land Use Committee, Victoria (British Columbia). Secretariat.
V. W. Loose, and G. C. Robinson.
Land Economics, Vol. 53, No. 4, p 488-491, November 1977. 6 ref.

Descriptors: *Fisheries, *Oysters, *Externalities, *Proprietary power, Northeast U.S., Model studies, Economics, Property rights, Legal aspects, Optimization, Employment.

A critique is given of a previous article by Agnello and Donnelley which presented a model of the U.S. east coast oyster fishery. The earlier article argued that inputs are not optimally allocated in the U.S. oyster industry and that the industry is particularly well-suited for analyzing effects of alternative property rights structures on resource allocation, since there is a mix of free-access and private beds. The model predicted that the average product of labor on the free-access beds is less than that on the privately held beds, and an empirical test was formulated which, it was claimed, supports the hypothesis. It was argued that the social optimum would be served by changing tenure from free-access to private holdings, and that this would not decrease employment; the 'grounds quality externality' mitigates the negative employment impact. Loose and Robinson offer two criticisms: (1) There is no evidence that a 'grounds quality externality' exists, and such effects as are discussed are simply the 'ownership externality' described by Bator. (2) The empirical evidence also supports the alternative hypothesis that the average product of labor free-access beds is less than on private beds simply because free-access beds are of innately lower quality. A critique is offered of Agnello and Donnelley's empirical evidence. (See also W78-06681) (Lynch-Wisconsin)
W78-06680

'EXTERNALITIES AND PROPERTY RIGHTS IN THE FISHERIES': A REPLY,
Delaware Univ., Newark. Dept. of Economics.
R. J. Agnello, and L. P. Donnelley.
Land Economics, Vol. 53, No. 4, p 492-495, November 1977. 7 ref.

Descriptors: *Fisheries, *Oysters, *Externalities, *Proprietary power, Northeast U.S., Model studies, Economics, Property rights, Legal aspects, Optimization, Employment.

Agnello and Donnelley reply to major criticisms by Loose and Robinson on their earlier article in which a model of the U.S east coast oyster fishery was presented. The original article argued that a 'grounds quality externality' mitigates the negative employment impact of a recommended change of oyster beds tenure from free-access to private holdings. Agnello and Donnelley argue that the average product of labor on the free-access beds is less than on privately owned beds; this supported, say the authors, by empirical evidence they supply. The critics questioned the existence of the 'grounds quality externality', and maintained that the empirical data also support the alternative hypothesis that the average product of labor on free-access beds is less because they are of innately lower quality. In this reply, the original authors assert that the criticisms do not affect the validity of the original results. They hold that 'grounds quality externality' is an example of Bator's dynamic ownership externality, and that such a distinction is useful. While Loose and Robinson maintain the oyster beds of innately higher productivity are leased, the private grounds in fact are barren or do not measure up to criteria for successful oyster growth. (See also W78-06680) (Lynch-Wisconsin)
W78-06681

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COSTS OF RADIUM REMOVAL FROM POTABLE WATER SUPPLIES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W78-06280

NEW PROCEDURE HELPS ENGINEERS SATISFY COST-CONSCIOUS CLIENTS,
Wisconsin Univ.-Madison. Dept. of Engineering.
W. R. Baker.
Water and Sewage Works, Vol. 124, No. 10, p 62-64, October 1977. 2 fig, 2 tab.

Descriptors: Life cycle costing, *Lost earnings, *Alternative costs, *Cost-effectiveness, Equipment, Engineering, Economics, Present worth, Interest rates, Mathematical models, Economic analysis, Compound amount factor, Planning, Engineering economics, Capital investments analysis.

Life cycle costing computes total ownership costs of an engineering system and combines initial purchase price with all future costs. Its basis is the lost earnings concept, which accounts for interest lost due to money being used to buy equipment rather than investing in an interest-yielding account. Life cycle costing, also referred to as engineering economics, analysis of capital investments, or the time value of money, is an important tool for comparing alternate construction and purchasing options. It computes the total and true costs of possession of an item over the ownership time span. These costs include: (1) purchase price; (2) construction; (3) operation and maintenance; (4) mortgage payments; (5) salvage, trade-in, or sale value at the end of the item's useful life; and (6) lost interest earnings on the purchase amount. Equivalence, another basic concept of life cycle costing, means that today's dollar is not euqal to a future dollar because of interest accruals and their growth effect over time. Present worth, or the current worth of a futrue sum, including compound interest, is equivalent to discounting in the investment field. Life cycle costs can be computed with a mathematical model, the compound amount factor (CAF). A sample problem is given employing life cycle costing. (Lynch-Wisconsin)
W78-06324

DETERMINING THE ECONOMICS OF FILTER CAPPING,
For primary bibliographic entry see Field 5D.
W78-06325

TECHNOLOGICAL ECONOMICS APPLIED TO WASTE RECOVERY AND TREATMENT PROCESSES,
Aston Univ., Birmingham (England). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W78-06327

EFFICIENT AND EQUITABLE PRICING FOR WASTEWATER SYSTEMS: THE MADISON METROPOLITAN SEWERAGE DISTRICT,
Wisconsin Univ.- Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5D.
W78-06358

COST MINIMIZATION FOR COAL CONVERSION POLLUTION CONTROL: A MIXED INTEGER PROGRAMMING MODEL,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W78-06359

OPTIMIZATION IN DESIGN OF PUMPING SYSTEMS,
Weston (Roy F.) Inc., West Chester, PA.
For primary bibliographic entry see Field 8C.
W78-06439

AN EXAMPLE OF EXCESS URBAN WATER CONSUMPTION,
Calgary Univ. (Alberta). Dept. of Civil Engineering.
For primary bibliographic entry see Field 3D.
W78-06575

OZONATION OF MAKE-UPWATER FOR SALMONIC FISH REARING FACILITIES,
Idaho Univ., Moscow. Dept. of Bacteriology and Biochemistry.
For primary bibliographic entry see Field 5D.
W78-06579

ESTIMATING AN EFFLUENT CHARGE: THE RESERVE MINING CASE,
Minnesota Univ., Minneapolis. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-06682

6D. Water Demand

PROJECTIONS OF ECONOMIC DEVELOPMENT ASSOCIATED WITH COAL-RELATED ACTIVITY IN MONTANA,
Montana State Univ., Missoula. Bureau of Business and Economic Research.
P. E. Polzin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 249, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, January, 1974. 33 p, 1 fig, 7 tab. 5 ref. OWRT C-5258(No. 4217)(1).

Descriptors: *Montana, *Economic prediction, *Coals, Industries, *Forecasting, Water demand, *Industrial development.

Projected economic impacts of three possible levels of coal-related developments in Montana are presented. Actual mining and energy facilities are projected as being located only in Big Horn, Rosebud, and Powder River Counties; however, Custer, Treasure, Musselshell, and Yellowstone Counties were also included in the projection analysis because the seven counties together include the local trade centers for the development area and thus constitute a meaninful economic region. The overall economic characteristics of the impact area did not change in the coal-related activity projected in the first scenario, wherein the additional five to six thousand jobs forecast could easily be accommodated by the natural increase in the local labor force. Developments projected in scenario II suggest major economic changes in the impact area after 1980 continuing to 2000. After 1980, almost 10,000 permanent new jobs would be added, with significant net immigration, lower unemployment, and a greater than average per capita income. Aggregate economic growth is expected to continue at a lower rate until 2000. Economic impact of scenario III is also most notable between 1980 and 1985, but with significant economic growth projected to begin earlier. Between 1980 and 1985, about 20,000 new jobs would be introduced and incomes would rise to 106% of the national average, with expansion continuing to 2000 at a slower pace. (Wares-IPA)
W78-06364

WATER REQUIREMENTS FOR FUTURE ENERGY DEVELOPMENT IN THE WEST: STATE PERSPECTIVES,
EG and G Idaho, Inc., Idaho Falls.
W. D. Gertsch, J. Sathaye, R. Ritschard, and S. Parker.
Available from the National Technical Information Service, Springfield, VA 22161 as LA-6688-MS, Price codes: A04 in paper copy, A01 in microfiche. Informal Report, LA-6688-MS, (UC-11 and UC-95c), August 1977. 57 p, 17 fig, 32 tab, 46 ref. ERDA W-7405-ENG 36.

Descriptors: *Water requirements, *Energy, *United States, Water, Regional development, Natural resources, Coals, Energy transfer, Future planning(Projected), Planning, *Energy development, *Western water resources, Regional energy assessment program, Economic development program.

The survey was prepared for the Water Resources Council and presented a summary of state views on the sufficiency of western water resources for energy development in the West. Possible impacts and problems associated with the commitment of water to energy use also were identified. The project was undertaken during September and October 1976. Drafts of each state summary were sent to the Council's western regional study directors in November, and this volume comprised the entire work. It covered only part of the participation by the Los Alamos Scientific Laboratory and the Energy Research and Development Administration in the Council's 1975 National Assessment. (Roberts-ISWS)
W78-06375

6E. Water Law and Institutions

FACING THE LONGTERM: AN INQUIRY INTO OPPORTUNITIES TO IMPROVE THE CLIMATE FOR RESEARCH WITH REFERENCE TO LIMNOLOGY IN CANADA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. R. Vallentyne.
Journal of the Fisheries Research Board of Canada, Vol 35, No 3, p 350-369, March 1978. 2 tab, 23 ref, 1 append.

Descriptors: *Research and development, *Planning, *Contracts, *Limnology, *Canada, Project planning, Administration, Management, Projects, Long-term planning, Budgeting, Governments, Institutions, Laboratories, Research priorities, Research climates.

Deterioration of the climate for research was the main concern expressed in individual interviews with 125 freshwater scientists. The principal problem cited in the Department of Fisheries and the Environment (DFE) was disruptions to the continuity and time frame essential to research; in universities, declining support for 'basic' research; and in both, a perceived lack of attention on the part of governments and the public to measures for the resolution of problems in the long-term. These perceptions were analyzed in terms of changing attitudes to environment, research, and science policy from 1957 to 1976. Specific suggestions to improve the climate for research in DFE were: implementation of a policy on research; 3-5 year continuity in funding; standardized evaluation of programs; periodic evaluation of committees; filling research manager positions with scientists on a temporary basis; and mechanisms to ensure adequate representation of national-international research (long term) interests. In universities there is a need for a shift in accent from individual to cooperative work, including graduate theses. A strategy needs to be developed within the research community to facilitate communication with the public and senior managers on long-term issues. Without an increase in the forces causing senior managers to be more responsive to the long-term, the climate for research will remain as a perennial problem. This is because managers are conditioned by their role to think and act 'short' in space and time, whereas scientists are conditioned by their role to think and act 'long' in space and time. Development of an independent 'scientific auditing' function, possibly coupled with existing financial auditing functions, is needed to improve the credibility of governments and industries in regard to resource interests that are 'long' in space and time. (Sims-ISWS)
W78-06217

FIFTH INTERNATIONAL SYMPOSIUM ON FRESH WATER FROM THE SEA,
Office of Naval Research, London (England).
For primary bibliographic entry see Field 3A.
W78-06301

INTEGRATION OF WATER SUPPLY STRATEGIES IN A DESERT AREA,
California State Dept. of Water Resources, Sacramento. Div. of Planning.
For primary bibliographic entry see Field 6B.
W78-06342

IMPACT OF FEDERAL AND STATE WATER QUALITY LAWS ON ALASKA NATIVE REGIONAL CORPORATIONS.
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5G.
W78-06366

VILLAGES AND SEQR,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 5G.
W78-06367

THE BARCELONA CONVENTION AND ITS PROTOCOLS,
Ministry of Foreign Affairs, Rome (Italy).
For primary bibliographic entry see Field 5G.
W78-06424

SAFETY OF DAMS, A REVIEW OF THE PROGRAM OF THE U. S. BUREAU OF RECLAMATION FOR THE SAFETY OF EXISTING DAMS.
National Research Council, Washington, D.C. Committee on the Safety of Dams.
For primary bibliographic entry see Field 8B.
W78-06522

ESTIMATING AN EFFLUENT CHARGE: THE RESERVE MINING CASE,
Minnesota Univ., Minneapolis. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-06682

6F. Nonstructural Alternatives

SUITE OF MATHEMATICAL FLOOD PLAIN MODELS,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-06563

6G. Ecologic Impact Of Water Development

PUERTO RICO'S WATER RESOURCES PROBLEMS AND RESEARCH NEEDS.
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.; and Department of Natural Resources, San Juan (Puerto Rico).
For primary bibliographic entry see Field 6B.
W78-06206

DRAFT ENVIRONMENTAL IMPACT STATEMENT - CHEMICAL WASTE INCINERATOR SHIP PROJECT (VOLUME 1 OF 2 - ENVIRONMENTAL ANALYSIS AND APPENDICES I, II, AND III, U.S. ENVIRONMENTAL PROTECTION AGENCY: DISPOSAL OF ORGANOCHLORINE WASTES BY INCINERATION AT SEA).
Maritime Administration, Washington, D.C.
For primary bibliographic entry see Field 5E.
W78-06265

DRAFT ENVIRONMENTAL IMPACT STATEMENT - CHEMICAL WASTE INCINERATOR SHIP PROJECT (VOLUME 2 OF 2 - APPENDIX IV, U.S. ENVIRONMENTAL PROTECTION AGENCY: DISPOSAL OF ORGANOCHLORINE WASTES BY INCINERATION AT SEA).
Maritime Administration, Washington, D.C.
For primary bibliographic entry see Field 5E.
W78-06266

CLIMATIC AND ECOLOGICAL ASPECTS OF DESERTIFICATION,
New South Wales Univ. (Australia). School of Geography.
For primary bibliographic entry see Field 2B.
W78-06338

FISHERIES PROBLEMS ASSOCIATED WITH THE DEVELOPMENT OF THE LOWER COLORADO RIVER,
S. J. Nicola.
In: Proceedings, United Nations Institute for Training and Research Conference on Alternative Strategies for Desert Development and Management, 31 May-10 June, 1977. Sacramento, California, Vol. 3, p 1-14. 3 fig, 2 tab, 4 ref.

Descriptors: *Fish management, *Colorado River, *Environmental effects, *Fish conservation, Ecology, Fisheries, Water management, Water resources development, River basin development, Water sports, Fresh water fish.

The main purpose was to review the history of the development of the lower Colorado River and describe the effects of development on the natural environment. Strong emphasis is placed on the effect of development on native fishes. An explanation as to how government agencies, including the California Department of Fish and Game, have dealt with the problems of fishery resource management in this changing environment is reviewed with an eye toward the possibility of restoring native fishes, as well as the continual management of existing sport fisheries. A table listing native and introduced fishes of the Lower Colorado is included. (Castricone-Arizona)
W78-06341

IMPACT OF FEDERAL AND STATE WATER QUALITY LAWS ON ALASKA NATIVE REGIONAL CORPORATIONS.
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5G.
W78-06366

VILLAGES AND SEQR,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 5G.
W78-06367

A REVIEW OF THE CORPS OF ENGINEERS' DRAFT ENVIRONMENTAL IMPACT ON THE FIRE ISLAND INLET TO MONTAUK POINT, NEW YORK, BEACH EROSION CONTROL AND HURRICANE PROTECTION PROJECT,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 4D.
W78-06368

ENVIRONMENTAL MANAGEMENT IN A MEDITERRANEAN PORT CITY: HAIFA,
United Nations Environment Programs, Geneva (Switzerland). International Labor Office.
For primary bibliographic entry see Field 5G.
W78-06470

AN ASSESSMENT OF ESTUARINE AND NEARSHORE MARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point. Applied Marine Science and Ocean Engineering.
For primary bibliographic entry see Field 2L.
W78-06528

THE INTERTIDAL FAUNA OF SANDY BEACHES. A SURVEY OF THE SCOTTISH COAST,
Aberdeen (Scotland). Marine Lab.
For primary bibliographic entry see Field 2L.
W78-06535

POLLUTANT TRANSFER TO THE MARINE ENVIRONMENT.
Rhode Island Univ., Kingston; and Texas Univ. at Austin. Port Aransas. Marine Science Inst.
For primary bibliographic entry see Field 5B.
W78-06549

STANDARDS OF ENVIRONMENTAL QUALITY FOR RECREATIONAL EVALUATION OF RIVERS,
Northwestern Univ., Evanston, IL. Technological Inst.
For primary bibliographic entry see Field 6B.
W78-06553

QUANTITATIVE ASSESSMENT OF NATURAL VALUES IN BENEFIT-COST ANALYSIS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 6B.
W78-06572

A SIMULATION MODEL FOR SCREENING A SYSTEM OF RESERVOIRS FOR ENVIRONMENTAL IMPACT,
MacLaren (James F.) Ltd., Willowdale (Ontario). Water Resources Group.
For primary bibliographic entry see Field 4A.
W78-06576

IMPACT OF COMMUNITY PLANNING ON QUALITY OF LIFE IN THE NORTH,
Canada Department of National Health and Welfare, Edmonton (Alberta). Medical Services.
For primary bibliographic entry see Field 5G.
W78-06577

7. RESOURCES DATA

7B. Data Acquisition

MICROWAVE INTERFERENCE DETECTION OF SUBSURFACE WATER,
Drexel Univ., Philadelphia, PA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-06225

THE USE OF REMOTE SENSING TECHNIQUES FOR DETECTION AND IDENTIFICATION OF POLLUTANT DISCHARGES,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 5A.
W78-06230

SATELLITE IMAGES OF LAKE ERIE ICE: JANUARY-MARCH 1975,
National Environmental Satellite Service, Washington, DC.
For primary bibliographic entry see Field 2C.
W78-06231

AOIPS WATER RESOURCES DATA MANAGEMENT SYSTEM,
Earth Satellite Corp., Washington, DC.
For primary bibliographic entry see Field 7C.
W78-06239

SOIL, WATER, AND VEGETATION CONDITIONS IN SOUTH TEXAS,
Agricultural Research Service, Weslaco, TX.
C. L. Wiegand.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-22630, Price codes: A02 in paper copy, A01 in microfiche. Quarterly Progress Report, April 1976. 21 p, 2 fig, 7 tab, 10 ref, 1 append. NASA S-53876-AG.

Descriptors: *Remote sensing, *Vegetation, *Crops, *Land use, *Texas, Satellites(Artificial), Classification, Citrus fruits, Ranges, Grain sorghum, Soils, Agriculture, Data processing, Analytical techniques, LANDSAT.

Software development for a computer-aided crop and soil survey system is nearing completion. The system was modified and tested by periodically classifying the crops and land uses in a 390,000 hectare county of diverse agricultural enterprises. Computer-aided variety classification accuracies using LANDSAT-1 MSS data for a 600 hectare citrus farm were 83% for Redblush grapefruit and 91% for oranges. These accuracies indicate that there is good potential for computer-aided inventories of grapefruit and orange citrus orchards with LANDSAT-type MSS data. The standard errors of estimate for the calibration of computer compatible tape coordinate system (pixel and record) to earth coordinate system (longitude and latitude) for 6 LANDSAT scenes ranged from 0.72 to 1.50 pixels and from 0.58 to 1.75 records. The regression coefficients appear to be good enough to locate closely ground sites of interest, even for scenes in which clouds obliterate most of the 30 reference landmarks. (Sims-ISWS)
W78-06240

GROUND WATER RECHARGE TO THE AQUIFERS OF NORTHERN SAN LUIS VALLEY, COLORADO: A REMOTE SENSING INVESTIGATION,
Colorado School of Mines, Golden, Dept. of Geology.
For primary bibliographic entry see Field 2F.
W78-06242

VISUAL SURF OBSERVATIONS/MARINELAND EXPERIMENT,
Coastal Engineering Research Center, Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-06252

DEVELOPMENT AND EVALUATION OF AN EXPERIMENTAL FRAZIL ICE MEASUREMENT INSTRUMENT,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2C.
W78-06313

TWO COMPLEMENTARY ULTRASONIC SYSTEMS.
For primary bibliographic entry see Field 5A.
W78-06510

VERSATILE WASTEWATER FLOWMETER,
For primary bibliographic entry see Field 5D.
W78-06511

FUNDAMENTAL ANALYSIS OF THE LINEAR MULTIPLE REGRESSION TECHNIQUE FOR QUANTIFICATION OF WATER QUALITY PARAMETERS FROM REMOTE SENSING DATA,
Old Dominion Univ., Norfolk, VA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-06550

MICROWAVE RADIOMETRIC SENSING OF SURFACE TEMPERATURE AND WIND SPEED FROM SEASAT,
Radiometric Technology, Inc., Wakefield, MA.
For primary bibliographic entry see Field 2L.
W78-06551

MOISTURE DETECTION APPARATUS,
For primary bibliographic entry see Field 3F.
W78-06668

7C. Evaluation, Processing and Publication

VALIDATION AND IMPLEMENTATION OF A SIMPLIFIED STREAMFLOW SIMULATOR,
Nebraska Univ., Lincoln. Dept. of Computer Science.
For primary bibliographic entry see Field 2E.
W78-06205

OPTIMAL OPERATION OF A FLOOD CONTROL RESERVOIR,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-06208

INPUT DATA FORMATS FOR ALLUVIAL CHANNEL EXPERIMENTS,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 8B.
W78-06235

AOIPS WATER RESOURCES DATA MANAGEMENT SYSTEM,
Earth Satellite Corp., Washington, DC.
E. S. Merritt, R. L. Shotwell, M. C. Place, and N. J. Belknap.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-14567, Price codes: A23 in paper copy, A01 in microfiche. Final Report, September 1976. 335 p, 19 fig, 9 tab, 10 ref, 2 append. NASA NAS5-22894.

Descriptors: *Remote sensing, *Utah, *Idaho, *Wyoming, *Data processing, Hydrology, Computers, *Computer programs, *Watersheds(Basins), Rainfall, Runoff, Snow cover, Snow melt, Mathematical models, Computer models, Satellites(Artificial), Water resources, LANDSAT data, *Bear River watershed(Utah-Ida-Wyo).

A geocoded data management system applicable for hydrological applications was designed for implementation on the AOIPS hardware at Goddard Space Flight Center. The emphasis throughout was on demonstrating the utility of the Atmospheric and Oceanographic Information Processing System (AOIPS) for hydrological applications. Within that context, the geocoded hydrology data management system was designed to take advantage of the interactive capability of the AOIPS hardware. Portions of the Water Resource Data Management System which best demonstrate the interactive natue of the hydrology data management system were implemented on the AOIPS. A hydrological case study was prepared using all data supplied by Goddard Space Flight Center for the Bear River watershed located in northwest Utah, southeast Idaho, and western Wyoming. (Sims-ISWS)
W78-06239

SOIL, WATER, AND VEGETATION CONDITIONS IN SOUTH TEXAS,
Agricultural Research Service, Weslaco, TX.
For primary bibliographic entry see Field 7B.
W78-06240

HISTORICAL STREAMFLOW SUMMARY, MANITOBA, TO 1976.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
(1977), 187 p. in English and French.

Descriptors: *Streamflow, Water resources, *Hydrologic data, *Data collections, Networks, *Surface waters, Publications, Surveys, *Canada, *Manitoba, Historical data, Hydrometric data, Stream discharge(1976).

This report contains a summary of monthly and annual mean discharges and annual extremes of discharge for rivers in Manitoba. The data cover that collected by the Water Survey of Canada up to 1976. The location of the station, drainage area, and whether the flow is natural or regulated are noted. Besides the monthly and annual means, maximum instantaneous discharges, the extreme for the period of record, and the annual total discharge are provided for most stations. (WATDOC)
W78-06310

HISTORICAL STREAMFLOW SUMMARY, SASKATCHEWAN, TO 1976.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
(1977), 299 p. in English and French.

Descriptors: *Steamflow, Water resources, *Hydrologic data, *Data collections, Networks, *Surface water, Publications, Surveys, *Canada, *Saskatchewan, Historical data, Hydrometric data, Stream discharge(1976).

This report contains a summary of monthly and annual mean discharges and annual extremes of discharge for rivers in Saskatchewan. The data cover that collected by the Water Survey of Canada up to 1976. The location of the station, drainage area, and whether the flow is natural or regulated are noted. Besides the monthly and annual means, maximum instantaneous discharges, the extreme for the period of record, and the annual total discharge are provided for most stations. (WATDOC)
W78-06311

MAGNITUDE AND FREQUENCY OF FLOODS IN SOUTHERN ONTARIO,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2E.
W78-06312

DEVELOPMENT AND IMPLEMENTATION OF A REGIONAL WATER PLANNING DATA MANAGEMENT SYSTEM,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W78-06360

GREATEST KNOWN AREAL STORM RAINFALL DEPTHS FOR THE CONTIGUOUS UNITED STATES,
NOAA National Weather Service, Silver Spring, MD. Office of Hydrology.
A. P. Shipe, and J. T. Riedel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 871, Price codes: A09 in paper copy, A01 in microfiche. Report NOAA-TM-NWS-HYDRO-33, December 1976. 178 p, 1 fig, 5 tab, 8 ref.

Descriptors: *Rainfall, *Depth-area-duration analysis, *Excessive precipitation, *United States, Precipitation(Atmospheric), Precipitation intensity, Rain, Distribution patterns, Probable maximum precipitation, Rain gages, Rainfall disposition, Storms, Precipitation excess, Climatology, Meteorology, *Data collections.

The greatest known areal storm rainfall depths for the contiguous United States were presented for the winter, spring, summer, and fall seasons. The depths were for 100, 200, 1,000, 5,000 and 10,000 sq mi (259, 518, 2590, 12,950, 25,900 sq km) for 6, 12, 24, and 48 hours. The rainfall values were given on maps and identified on adjacent tables. (Sims-ISWS)
W78-06380

THE DYNAMICS OF STRATIFICATION AND OF STRATIFIED FLOW IN LARGE LAKES.
International Joint Commission-United States and Canada, Windsor (Ontario). Standing Committee on the Scientific Basis for Water Quality Criteria.
For primary bibliographic entry see Field 2H.
W78-06388

SOME OBSERVATIONS OF STRATIFIED FLOW IN LARGE, THERMALLY STRATIFIED LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W78-06389

SOME OBSERVATIONS ON FREELY PROPAGATING INTERNAL WAVES IN LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W78-06390

METHODS FOR REFINING SAMPLE ESTIMATES OF THE PARAMETERS OF HYDROLOGIC SERIES,
For primary bibliographic entry see Field 2E.
W78-06403

COMPUTERIZATION AND AUTOMATION OF WASTEWATER SYSTEMS,
For primary bibliographic entry see Field 5G.
W78-06427

WHITHER AUTOMATIC CONTROL IN THE SEWAGE TREATMENT FIELD,
Kent Instruments Ltd., Luton (England).
For primary bibliographic entry see Field 5D.
W78-06448

TREATMENT PLANT AND PIPELINE FLOW CONTROLLED BY MINICOMPUTER SYSTEM.
For primary bibliographic entry see Field 5D.
W78-06450

DUTCH TREAT SEWAGE BY COMPUTER SYSTEM.
For primary bibliographic entry see Field 5D.
W78-06454

AUTOMATION OF WASTE WATER TREATMENT PLANTS--PART 1--DATA COLLECTION AND USE,
Anglian Water Authority, Norwich (England). Norwich Sewage Div.
For primary bibliographic entry see Field 5D.
W78-06472

APPLICATION OF COMPUTER MODELING FOR CAPACITY STAGING OF DENVER, COLO., WATER-TREATMENT FACILITIES,
Colorado School of Mines, Golden. Dept. of Basic Engineering.
For primary bibliographic entry see Field 5F.
W78-06559

CALIBRATION OF HYDROLOGICAL MODEL USING OPTIMIZATION TECHNIQUE,
Severn-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 2A.
W78-06561

LAND DATA MANAGEMENT SYSTEM FOR RESOURCE PLANNING,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 4A.
W78-06570

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1976 TO SPRING 1977,
Geological Survey, Tucson, AZ. Water Resources Div.
H. M. Babcock.
Water-Resources Investigations 77-106 (open-file report), September 1977. 2 sheets, 23 ref.

Descriptors: *Groundwater resources, *Arizona, *Pumping, *Irrigation, *Water level fluctuations, *Maps, Aquifers, Water yield, Water wells, Water levels, Projections, Water demand, Water utilization.

Two small-scale maps of Arizona show (1) pumpage of ground water by areas and (2) the status of the ground-water inventory in the State. The main map, which is at a scale of 1:500,000, shows potential well production, depth of water in selected wells in spring 1977, and change in water level in selected wells from 1972 to 1977. The brief text that accompanies the maps summarizes the current ground-water conditions in the State. The withdrawal of ground water was about 5.5 million acre-feet in Arizona in 1976 of which about 4.7 million acre-feet was used for the irrigation. The Salt River Valley and the lower Santa Cruz basin are the largest agricultural areas in the State. For 1972-76, ground-water withdrawal in the two areas was about 8.2 to 4.9 million acre-feet, respectively, and, in general, water levels are declining. Other areas in which ground-water withdrawals have caused large water-level declines are the Willcox, San Simon, upper Santa Cruz, Avra Valley, Gila Bend, Harquahala Plains, and McMullen Valley areas. (Woodard-USGS)
W78-06583

SALTWATER INTRUSION IN THE SHALLOW AQUIFER IN PALM BEACH AND MARTIN COUNTIES, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
W. B. Scott, L. F. Land, and H. G. Rodis.
Water-Resources Investigations 76-135 (open-file report), 1977. 1 sheet, 2 fig, 10 ref.

Descriptors: *Saline water intrusion, *Aquifers, *Florida, *Coasts, *Pumping, Drawdown, Water supply, Water demand, Saline water-freshwater interfaces, *Maps, Aquifer characteristics, *Martin County(Fla), *Palm Beach County(Fla).

Urban growth has been rapid in recent years in Palm Beach and Martin Counties, Fla. The withdrawal of large quantities of fresh ground water in the vicinity of the coast has reduced or locally reversed the natural seaward hydraulic gradient and, in places, allowed saltwater to advance landward in the aquifer, displacing freshwater. Maps show the position of the saltwater front in eight urban areas adjacent to the coast. The saltwater front, as shown on the profiles, is based on a chloride concentration of 250 mg/liter which is recommended as a limit for water that is considered potable. The chloride concentration of native freshwater almost always is less than 50 mg/liter in the coastal aquifer. (Woodard-USGS)
W78-06584

MAP SHOWING GROUND-WATER CONDITIONS IN THE LOWER VERDE RIVER AREA, MARICOPA, YAVAPAI, AND GILA COUNTIES, ARIZONA-1976,
Geological Survey, Tucson, AZ. Water Resources Div.
P. P. Ross.
Water-Resources Investigations 77-113 (open-file report), October 1977. 1 sheet, 5 ref.

Descriptors: *Groundwater resources, *Arizona, *Water levels, *Water quality, *Maps, Aquifers, Water wells, Water table, Chemical analysis, *Lower Verde River area(Ariz), Maricopa County, Yavapai County, Gila County.

Arizona is divided into 67 ground-water areas, and individual areas are selected for intensive data collection once every 6 years. The data collected in the lower Verde River area are given on a map that shows altitude of the water level, depth of water, well depth, chemical quality of the water, and irrigated area. Scale 1:125,000. (Woodard-USGS)
W78-06585

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1976.
Geological Survey, Salt Lake City, UT. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 927, Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report UT-76-1, August 1977. 617 p, 7 fig.

Descriptors: *Utah, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for Utah consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality of ground water. This report contains discharge records for 240 gaging stations; stage and contents for 21 lakes and reservoirs; water quality for 42 hydrologic stations, 123 partial-record stations and 387 wells; and water levels for 152 observation wells. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Utah. (Woodard-USGS)
W78-06594

WATER RESOURCES DATA FOR MINNESOTA, WATER YEAR 1975.
Geological Survey, St. Paul, MN. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 952, Price codes: A22 in paper copy, A01 in microfiche. Water-Data Report MN-75-1, August 1976. 513 p, 4 tab, 26 ref.

Descriptors: *Minnesota, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1975 water year for Minnesota consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 127 gaging stations; stage only records for 1 gaging station; stage and contents for 9 lakes and reservoirs; water quality for 40 gaging stations, 14 partial-record flow stations, 25 lakes, and 60 wells; and water levels for 25 observation wells. Also included are 149 crest-stage partial-record stations and 157 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Minnesota. (Woodard-USGS)
W78-06595

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1976--VOLUME 1. ARKANSAS RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 785, Price codes: A22 in paper copy, A01 in microfiche. Water-Data Report OK-76-1, August 1977. 513 p, 6 fig.

Descriptors: *Oklahoma, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Arkansas River basin(Okla).

Water resources data for the 1976 water year for Oklahoma consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes or reservoirs; and water levels and water quality or ground water. Volumes 1 and 2 of this report contain discharge records for 122 gaging stations, stage and contents for 22 lakes or reservoirs, and water quality for 95 gaging stations and 3 lakes. Also included are 44 crest-stage partial-record stations and 1 low-flow partial-record station. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Oklahoma. This volume (Volume 2) includes the Arkansas River basin. (Woodard-USGS)
W78-06596

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1976--VOLUME 2. RED RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 786, Price codes: A10 in paper copy, A01 in microfiche. Water-Data Report OK-76-2, August 1977. 216 p, 6 fig.

Descriptors: Oklahoma, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sedi-

ment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Red River basin(Okla).

Water resources data for the 1976 water year for Oklahoma consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of reservoirs; and water levels and water quality of ground water. Volume 1 and 2 of this report contain discharge records for 122 gaging stations, stage and contents for 22 lakes or reservoirs, and water quality for 95 gaging stations and 3 lakes. Also included are 44 crest-stage partial-record stations and 1 low-flow partial-record station. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Oklahoma. This volume (Volume 2) includes the Red River basin. (Woodard-USGS)
W78-06597

GROUND-WATER DATA FOR MICHIGAN, 1976,
Geological Survey, Lansing, MI. Water Resources Div.
G. C. Huffman.
Michigan Geological Survey Department of Natural Resources, Lansing, 1977. 56 p, 6 fig, 2 tab, 108 ref.

Descriptors: *Groundwater resources, *Well data, *Water levels, *Water users, *Michigan, Pumping, Water yield, Hydrographs, Water level fluctuations, Observation wells, Groundwater recharge, Precipitation(Atmospheric).

This report summarizes data on ground-water levels in 167 observation wells in Michigan, and provides information on well locations, depths, elevations, and aquifers. Tabulated data include extremes of water levels for the year 1976 and for the period of record. Also tabulated is the pumpage of most major ground-water users in the State. Levels were generally above average in most areas through spring of 1976, but declined to near or below average by the end of the year. During the year, water levels reached record highs in 32 wells and dropped to record lows in 20 wells. (Woodard-USGS)
W78-06598

DIGITAL COMPUTER SIMULATION MODEL OF THE ENGLISHTOWN AQUIFER IN THE NORTHERN COASTAL PLAIN OF NEW JERSEY,
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-06601

HYDROLOGIC DATA FOR LITTLE ELM CREEK TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, TX. Water Resources Div.
R. M. Slade, Jr., and J. M. Taylor.
Open-file report 77-83, May 1977. 108 p, 2 fig, 4 tab.

Descriptors: *Hydrologic data, *Storm runoff, *Small watersheds, *Retaining walls, *Texas, Rainfall, Runoff, Streamflow, Water storage, *Little Elm Creek, *Trinity River basin(Tex).

This report contains rainfall, runoff, and storage data collected during the 1975 water year for a 75.5 sq mi area above the stream-gaging station Little Elm Creek near Aubrey, Texas. Floodflows from 35.7 sq mi of the area are regulated by 16 floodwater-retarding structures constructed by the Soil Conservation Service. Six storm periods were selected for detailed computations and analyses. Water-quality data is given for Little Elm Creek. (Woodard-USGS)
W78-06604

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, TX. Water Resources Div.
H. D. Buckner.
Open-file report 77-72, May 1977. 19 p, 1 fig.

Descriptors: *Hydrologic data, *Streamflow, *Reservoir storage, *Water quality, *Small watersheds, Texas, Inflow, Discharge(Water), Rainfall, *Mountain Creek, *Trinity River basin(Tex).

Mountain Creek drains the northeast corner of Johnson County, the northwest corner of Ellis County, the southeast corner of Tarrant County, and part of the southwest corner of Dallas County, Tex. The basin is 30 miles long and averages 10 miles in width. The total drainage area at the mouth is 304 sq mi. Basin outflow for the 1975 water year was 146,400 acre-feet which is 68,880 acre-feet above the 15-year (1960-75) average of 77,520 acre-feet. Storage in Mountain Creek Lake showed a net loss of 150 acre-feet during the water year. Rainfall over the study area for the 1975 water year was about 39 inches, which is about 5 inches above the 15-year mean for the area. (Woodard-USGS)
W78-06605

STATUS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX)--SEPTEMBER 1977,
Geological Survey, Reston, VA. Water Resources Div.
M. D. Edwards.
Open-file report 78-154, 1978. 26 p, 1 fig, 4 tab, 4 ref, 2 append.

Descriptors: *Data storage and retrieval, *Water resources, *Bibliographies, *Information retrieval, *Management, Information exchange, Indexing, Systems analysis, Computer programs, *National Water Data Exchange.

Major progress in the implementation of the National Water Data Exchange (Nawdex) took place during Fiscal Year 1977--beginning October 1, 1976 and ending September 30, 1977. This report describes the status of the program at the end of this period. Program advancement is reported in the areas of administration, membership, Local Assistance Center facilities, development of the Water Data Sources Directory and the Master Water Data Index data bases, development of systems related to these data bases, and the coordination of services available through member orgaizations. (Woodard-USGS)
W78-06607

COPEPOD 2: A MARKOV-TYPE MODEL FOR COPEPOD POPULATION DYNAMICS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 5C.
W78-06696

8. ENGINEERING WORKS

8A. Structures

A REVIEW OF THE CORPS OF ENGINEERS' DRAFT ENVIRONMENTAL IMPACT ON THE FIRE ISLAND INLET TO MONTAUK POINT, NEW YORK, BEACH EROSION CONTROL AND HURRICANE PROTECTION PROJECT,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 4D.
W78-06368

ENGINEERING CONDITION SURVEY AND STRUCTURAL INVESTIGATION OF MONTGOMERY LOCKS AND DAM, OHIO RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
C. E. Pace, and J. T. Peatross, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 655, Price codes: A10 in paper copy, A01 in microfiche. Miscellaneous Paper C-77-2, March 1977. 202 p, 58 fig, 6 tab, 3 ref, 1 append.

Descriptors: *Ohio River, *Pennsylvania, *Stress analysis, *Structural stability, *Non-destructive tests, *Concrete structures, *Deterioration, Dams, Locks, Hydraulic structures, Concrete testing, Safety factors.

Results are presented of an engineering condition survey and a structural analysis of Montgomery Locks and Dams, Ohio River. There is general spalling, leaching, and cracking of the concrete surfaces. The crack survey implied that a majority of the cracking in the lock walls is caused by barge impact. The longitudinal crack parallel to the lock in the middle wall of Montgomery Lock was hypothesized to be caused by barge impact; therefore, this can be a source of deterioration which increases with lock use. The soniscope study indicated that the cracking along the center of the middle wall does not worsen with depth. Maintenance of the surface cracks and spalled areas is essential. In relation to present-day criteria, almost all of the monoliths on the land wall are inadequate in their resistance to overturning and base pressures. In general, the monoliths in middle and river walls are inadequate in their resistance to overturning. The miter sills are inadequate for sliding if the locks are dewatered. Since corrective action is needed, a feasibility study should be made to determine what action is necessary which will provide the most economical and adequate lock usage over a period of 30 to 50 years. (Adams-ISWS)
W78-06378

A DYNAMIC STUDY OF WATERWORKS PIPING UNDER EARTHQUAKE SHOCKS, (IN JAPANESE),
H. Otsuki, Y. Nakamichi, and K. Kawasaki.
Journal of Japan Water Works Association, No. 517, p 2-18, October, 1977. 30 fig, 6 tab, 28 ref.

Descriptors: *Conduits, *Hydraulic structures, *Seismic studies, *Earthquake engineering, *Conveyance structures, Seismic design, Seismic waves, Shear stress, Stress analysis, Shear.

The impact of earthquake tremors on various types of underground pipe conduits for water transport was examined within the context of theoretical pipe dynamics. Subsurface conduits extend along the ground surface and are encased in sand and soil. The seismic force of an earthquake acting on basement causes shearing as surface waves move over the superficial base. The resulting ground deformation causes similar deformation and stress in the conduit body. The stress resulting from the seismic force and ground deformation is distributed over various parts of the pipe. The earthquake tremor causes the ground to vibrate, initiating a parallel vibration of the underground conduit. This sympathetic response to the seismic vibration of the ground occurs in all underground conduits. (Lisk-FIRL)
W78-06697

8B. Hydraulics

ALGEBRAIC SOLUTION OF THE HORTON-IZZARD TURBULENT OVERLAND FLOW MODEL OF THE RISING HYDROGRAPH,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-06215

RIVER-INDUCED CURRENTS IN A FJORD LAKE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2A.
W78-06219

WAVE REFLECTION AND TRANSMISSION AT PERMEABLE BREAKWATERS,
Massachusetts Inst., of Tech. Cambridge. Dept. of Civil Engineering.
C. K. Sollitt, and R. H. Cross, III.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 000, Price codes: A09 in paper copy, A01 in microfiche. Technical Paper No. 76-8, July 1976. 172 p, 44 fig, 4 tab, 32 ref, 7 append. DACW72-68-C-0032.

Descriptors: *Breakwaters, *Coastal structures, *Waves(Water), Laboratory tests, Theoretical analysis, Turbulent flow, Porous media, Fluid mechanics, Permeability, Reflectance, Equations, Mathematical studies, *Permeable breakwaters, *Wave reflection, *Wave transmission, Reflection coefficients, Transmission coefficients, Rubble-mound breakwaters.

Observations of rubble-mound breakwaters interacting with surface waves in laboratory models and in field applications demonstrated that significant wave energy is transmitted through structures commonly regarded as being impervious. The objective of the investigation was the development of a theoretical analysis to account for this phenomenon. Three breakwater configurations were considered: (1) crib-style breakwaters with vertical walls and homogeneous fill; (2) conventional trapezoidal shaped breakwaters with layered fill; and (3) pile-array breakwaters composed of vertical piles placed in symmetric patterns. Waves were assumed to arrive at normal incidence. The unsteady equations of motion for flow in the voids of an arbitrary porous structure were linearized using a technique which approximates the known turbulent damping condition inside the structure. Linear wave theory was assumed to apply outside the structure, and the excitation was provided by a monochromatic incident wave. A semi-empirical method was used to approximate the effect of wave breaking. An experimental program was conducted to verify the analytical models. Theory and experiment yield the following general conclusions; (1) the transmission coefficient decreases with decreasing wavelength, breakwater porosity and permeability, and increasing wave height and breakwater width; and (2) the reflection coefficient decreases with increasing wavelength, breakwater porosity and permeability, and decreasing breakwater width. (Adams-ISWS)
W78-06229

INPUT DATA FORMATS FOR ALLUVIAL CHANNEL EXPERIMENTS,
Colorado State Univ., Fort Collins. Engineering Research Center.
K. Mahmood, T. Masood, and G. L. Eyster.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 230, Price codes: A10 in paper copy, A01 in microfiche. Report No. CER75-76KM-TM-GLE39, May 1976. 208 p.

Descriptors: *Data storage and retrieval, *Alluvial channels, Documentation, Hydrology, Sediment transport, Computers, Channels, Foreign countries, Foreign research, *Computer programs, *India, *Pakistan, *Experimental data.

Various experiments covering hydraulic, morphologic, and sediment characteristics of alluvial channels are being conducted on the Link Canals of Pakistan. Data from these experiments are to be punched on cards for use on digital computers. The formats have been designed with enough flexibility to cater for any variation that may occur within the scope of the experiment. (Lee-ISWS)
W78-06235

HYDROGRAPH SYNTHESIS USING LANDSAT REMOTE SENSING AND THE SCS MODELS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-06236

POTAMOLOGY INVESTIGATION, RELATIONSHIP BETWEEN CALCULATED HYDRAULIC PARAMETERS AND PHYSICAL FEATURES OF THE CHANNEL.
Water and Environment Consultants, Inc., Fort Collins, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 719, Price codes: A03 in paper copy, A01 in microfiche. Prepared by Army Engineer District, Omaha, Nebraska, April 1976. 26 p, 10 fig, 5 tab, append. Army DACW45-75-D-0003.

Descriptors: *Missouri River, *Channel morphology, *Rivers, Channels, Channel improvement, Erosion, Sediments, Flow, Streamflow, River flow, Flow control, Hydraulics, River training, Discharge(Water), Water levels, Degradation(Stream), Control structures, Dams, Flow resistance, Sand bars, Potamology.

The data gathered in the 1971 Hydrographic Survey of the Missouri River by the Army Corps of Engineers, Omaha District, Were studied to determine the relationships between the physical features (i.e., area, control structures, and bend geometry) to the hydraulic parameters (i.e., average velocity, shear velocity, and resistance of flow). Recommendations concerning data collection were presented. The results of the analysis showed that resistance to flow is directly proportional to flow area and the hydraulic radius, whereas it is indirectly proportional to the velocity. The effects of the bend geometry (radius of curvature, length of bend, and central angle of bend) on the resistance to flow seem to be masked out by effects of the major sand bars, by training works constructed along the reaches, and by changes in the bed roughness. A steady increase in the size of bed material is present for the whole reach studies, indicating possible changes in the resistance to flow. Also, potential points or problem areas in terms of navigation depth and local aggradation can be found through inspection of the six plates prepared for the data. (Sims-ISWS)
W78-06237

POTAMOLOGY INVESTIGATION, A STUDY OF THE SHIFT IN THE STAGE-DISCHARGE RELATIONSHIP OF THE MISSOURI RIVER AT SIOUX CITY, IOWA.
Water and Environment Consultants, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 4A.
W78-06238

IMPLICATIONS OF SUBMERGENCE FOR COASTAL ENGINEERS,
Coastal Engineering Research Center, Fort Belvoir, VA.
E. B. Hands.
Army Coastal Engineering Research Center Reprint 78-7, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 149-166, 7 fig, 2 tab, 51 ref.

Descriptors: *Submergence, *Sea level, *Subsidence, *Shore protection, Erosion, Flooding, Water resources, Outer Continental Shelf, Pollutant transport, Eustatic changes.

Submergence affects most US shorelines, and has created serious problems in many localities by increasing flooding, accelerating erosion, altering surface drainage, and causing structural damage. The purpose of this paper is to present selected examples illustrating the problems engineers face in areas of coastal submergence and to discuss in general how sea-level changes affect long term shore processes. (Sinha-OEIS)
W78-06244

SEDIMENT HANDLING AND BEACH FILL DESIGN,
Coastal Engineering Research Center, Fort Belvoir, VA.
R. D. Hobson.
Army Coastal Engineering Research Center Reprint 78-10, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 167-180, 4 fig, 2 tab, 10 ref.

Descriptors: *Shore protection, *Beaches, *Dredging, Gravels, Sands, Water resources, New York, North Carolina, Design, *Beach fill, Pollutant transport, Transfer processes, Beach nourishment.

Offshore sand and gravel deposits constitute an extensive mineral resource whose importance and economic value increase steadily as onshore and lagoonal sources become unavailable. One major use of these marine deposits is for beach nourishment where the amount of initial fill material needed and the expected periodic renourishment requirements are usually estimated using fill factor and renourishment beach fill models. Two cases are examined where adequate data are available to quantify some effects of dredging and handling on sediment texture. Both cases studied indicate that the winnowing of fine sediments during handling operations produces fill sands that are generally coarser and better sorted than bottom sediments, and that these changes tend to improve the predicted performance of fill sediments. Volumetric losses are fairly high for the examples presented and such losses deserve consideration when estimating the overfill and renourishment elements of project design. (Sinha-OEIS)
W78-06245

EVALUATION OF A CONCRETE BUILDING BLOCK REVETMENT,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8F.
W78-06248

DESIGNING FOR BANK EROSION CONTROL WITH VEGETATION,
Coastal Engineering Research Center, Fort Belvoir, VA.
P. L. Knutson.
Army Coastal Engineering Research Center Reprint 78-2, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 716-733, 7 fig, 3 tab, 24 ref.

Descriptors: *Bank erosion, *Stabilization, *Marsh plants, *Design criteria, Estuaries, Erosion, Shore protection, Water resources, Outer Continental Shelf, Pollutant transport.

Marsh plants are effective in stabilizing eroding banks in sheltered coastal areas. Exceptional results have been achieved in a variety of intertidal environments at a fraction of the cost required for comparable structural protection. Techniques are available for the efficient propagation of several marsh plants for use in bank stabilization. This paper provides design criteria for determining site suitability; selecting plant materials and planting methods; and estimating labor requirements on a project by project basis. (Sinha-OEIS)
W78-06249

SEDIMENTS IMPOUNDED BY AN OFFSHORE BREAKWATER,
Coastal Engineering Research Center, Fort Belvior, VA.
For primary bibliographic entry see Field 2L.
W78-06251

DISPERSION OF BUOYANT WASTE WATER DISCHARGED FROM OUTFALL DIFFUSERS OF FINITE LENGTH,
California Inst. of Tech., Pasadena.
For primary bibliographic entry see Field 5B.
W78-06269

BUOYANCY EFFECTS IN THERMALLY STRATIFIED OPEN-CHANNEL FLOW,
Iowa Univ., Iowa City. Dept. of Mechanics and Hydraulics.
G-J. Hwang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 156, Price codes: A10 in paper copy, A01 in microfiche. Doctoral Thesis, July, 1975. 201 p, 30 fig, 1 tab, 28 ref, 3 append. OWRT C-3140(No. 3692)(3).

Descriptors: *Flow characteristics, *Flow profiles, *Approximation method, *Buoyancy, Equations, Effluents, Channel flow, Temperature, Velocity, Turbulent boundary layers, *Water flow behavior, Perturbations, Thermal discharge.

Expansion of successive approximations was used to investigate the detailed flow behavior from the injection of a heated effluent flow without excess momentum at the surface of a cooler ambient open channel flow. A perturbation procedure solved numerically the convective-diffusion equation and the equations of motion by the modified Hartree-Womersley method. Simulated experimental entrance conditions for the zero order density and the first order velocity perturbations were utilized; controlled flume experiments were conducted to obtain data for comparison with and verification of the numerical results. Significant buoyancy effects for a thermally stratified open-channel flow were: (1) slight change in the Von-Karman constant; (2) existence of a multilayered flow structure upstream with alternating negative and positive velocity perturbations in successive layers, and further downstream, a two-layered flow structure with positive upper and negative bottom region velocity perturbations; (3) modification of the longitudinal velocity profile from a logarithmic to a logarithmic-linear law with empirical coefficients and the Monin-Obukhov length as a scaling parameter; and (4) a small vertical velocity component with entrainment of warm fluid from below the water surface. Findings were supported more qualitatively than quantitatively. Perturbation was judged useful for certain types of practical thermal discharge problems; modified numerical procedure was a convenient and economical method. Appendices contain calculations on the effluent thickness and boundary value problem and the computer program. (Wares-IPA)
W78-06371

HYDRAULIC FRACTURING OF DRILLED WATER WELLS IN CRYSTALLINE ROCKS OF NEW HAMPSHIRE,
New Hampshire Dept. of Resources and Economic Development, Concord. State Geologists Office.
For primary bibliographic entry see Field 4B.
W78-06372

ENGINEERING CONDITION SURVEY AND STRUCTURAL INVESTIGATION OF MONTGOMERY LOCKS AND DAM, OHIO RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
For primary bibliographic entry see Field 8A.
W78-06378

URBANIZATION: HYDROLOGIC-HYDRAULIC-DAMAGE EFFECTS,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 4C.
W78-06385

NOTE ON LABORATORY MODELING OF SEASONAL THERMOCLINE,
Delaware Univ., Newark, Coll. of Marine Studies.
For primary bibliographic entry see Field 2H.
W78-06398

CALCULATION OF FLOW RESTRICTION LENGTHS FOR RAIN OVERFLOW AND BASINS (BERECHNUNG DER DROSSELSTRECKE VON REGENUEBERLAEUFEN UND REGENBECKEN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
W. Munz.
Gas-Wasser-Abwasser, Vol 57, No 12, p 869-875, 1977. 10 fig, 4 tab, 8 ref.

Descriptors: *Conduits, *Pipelines, *Storm water, *Overflow, *Hydraulic models, Culverts, Surface drainage, Attenuation, Channel flow, Pipe flow, Treatment facilities, Waste water treatment, Municipal wastes.

A hydraulic study of the flow of water through a pipe culvert toward a treatment plant is applied to the limitation of storm water overflow conditions in a rain basin. The relationship of the inlet level to the culvert is calculated according to the difference in water flow heights before and after the culvert inlet. Positioning of the weir is dependent upon the upstream flow velocity in the incoming sewer. The height should allow an incoming velocity high enough to prevent sedimentation in the pipe. By simulating these flow conditions, unfavorable oscillations in the pipe can be avoided and proper flow established. By restricting these flow conditions in the culvert, self-priming action in the culvert may be controlled. (Lisk-FIRL)
W78-06428

OPTIMIZATION IN DESIGN OF PUMPING SYSTEMS,
Weston (Roy F.) Inc., West Chester, PA.
For primary bibliographic entry see Field 8C.
W78-06439

MODIFYING MANNING'S EQUATION FOR FLOW RATE ESTIMATES,
K. J. Lanfear, and J. J. Coll.
Water and Sewage Works, Vol 125, No 3, p 68-69, March, 1978. 3 fig, 2 tab.

Descriptors: *Manning's equation, *Flow rate, *Sewerage, *Pipelines, *Mathematical models, Depth, Slopes, Velocity, On-site investigations, Flow measurement, Municipal wastes.

A modification of Manning's equation is developed to reduce the error of flow calculation in municipal sewage pipes and manholes and to eliminate the need for measuring slope. Estimation of the Manning's coefficient can lead to a 15% error in the calculated flow rates. The measurement of slope in old, deteriorated, or defective pipes is not always accurate enough to provide accurate flow data. Manning's equation also does not take into account the variation of the Manning's equation involves determining the function of slope with a single flow measurement. The slope function is calculated according to measured values of velocity, area, hydraulic radius, pipe diameter, and depth of flow. Flow rates in several manholes are measured with velocity meter used in conjunction with depth of flow, the modified Manning's equations, and the conventional Manning's equation. Flow rates calculated by the modified Manning's equation agreed with measured values obtained in three manhole tests. Flow rates calculated according to the conventional Manning's equation agreed with the measured flow rate in only one instance, overestimating or underestimating flow rate in the other two tests. (Lisk-FIRL)
W78-06475

SAFETY OF DAMS, A REVIEW OF THE PROGRAM OF THE U. S. BUREAU OF RECLAMATION FOR THE SAFETY OF EXISTING DAMS.
National Research Council, Washington, D.C. Committee on the Safety of Dams.
National Academy of Sciences, Washington, D.C., 1977. 70 p, 22 ref, append.

Descriptors: *Dam safety, Dams, Dam failure, Dam design, Earth dams, Safety factors, Safety, Bureau of reclamation, Instrumentation, Earthquake engineering, Seismographs, Landslides, Hazards, Model studies, Inundation maps, Seismic design, Earthquake estimation, Risk analysis.

The NRC Committee on the Safety of Dams made specific recommendations to the Bureau of Reclamation: Establish an independent dam safety office, responsible directly to the Commissioner of Reclamation, to discharge the single function of dam and reservoir safety in the public interest. Ensure that adequate funds and manpower are provided to accomplish all essential elements of dam safety within established time frames. Extend the recently adopted policy to use independent consultants on all future designs for major dams to encompass engineering evaluation for safety of existing dams. Provide field instrumentation to monitor the behavior of dam structures and to assist in evaluating safety for all major dams. Locate strong motion seismographs at all major damsites in earthquake zones 3 and 4. Increase the scope of and participation in the examinations under the Review of Maintenance Program in order to obtain a comprehensive technical assessment of project features. Establish a landslide surveillance program by identifying all significant active, inactive and potential landslides at every reservoir. Improve hydrological methodologies such as application of mathematical watershed models, spillway design flood methodology and state-of-the-art methods to develop inundation maps. Make a more complete geologic and seismologic analysis for existing dams in order to estimate maximum credible earthquakes in regions of high to moderate seismicity or from active faults. Establish a more effective and comprehensive emergency preparedness program. Consider Engineering and Research Center organizational changes to strengthen the role and responsibility of engineering geologists and geotechnical engineers. Give consideration to the preparation and implementation of a probabilistic or risk analysis program for the purpose of ranking major dams in accordance with the hazard potential and probability of a failure or partial failure of the structure.
W78-06522

BEACH NOURISHMENT TECHNIQUES. REPORT 2: A MEANS OF PREDICTING LITTORAL SEDIMENT TRANSPORT SEAWARD OF THE BREAKER ZONE,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 2L.
W78-06534

OPTIMAL DESIGN OF WATER DISTRIBUTION NETWORKS,
Rome Univ. (Italy). Ist. di Aerodinamica.
For primary bibliographic entry see Field 4A.
W78-06562

STRUCTURAL FLOOD CONTROL PLANNING,
Bell Lab., Holmdel, NJ.
For primary bibliographic entry see Field 4A.
W78-06567

ON LEVEL CROSSINGS AND CYCLES IN DAM PROCESSES,
Utrecht Rijksuniversiteit (Netherlands). Mathematical Inst.
J. W. Cohen, and M. Rubinovitch.
Mathematics of Operations Research, Vol. 2, No. 4, p 297-310, November 1977. 1 fig, 14 ref.

Descriptors: *Dams, *Stochastic processes, *Optimization, Markov processes, Costs, Revenue maximization, Repetitive cycles, Behavior, Equations, Mathematical models, Operations research.

The classical dam with input according to a process with stationary, independent increments and output at unit rate is considered. The stochastic properties of level crossings, i.e., up- and downcrossings, of a fixed level $x > 0$ are studied. It is shown that successive downcrossings of any such level constitute a renewal process with a.s. strictly positive lifetimes. This property allows the content process to be described as a regenerative process. In fact, several types of imbedded renewal processes may be defined and various cycles in the content process may be identified. The number of downcrossings of a fixed level in each such cycle as well as other functionals are studied. In particular, some new properties of the zero set of the dam process are obtained. This study has arisen from questions in cost optimization problems of dams and a simple example is discussed to illustrate the use of the results in this context. (Bell-Cornell)
W78-06569

FLOOD MANAGEMENT FOR SMALL URBAN STREAMS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 4A.
W78-06571

PROBLEMS ASSOCIATED WITH MAINTENANCE OF CHANNEL CAPACITY BELOW FEDERAL RESERVOIRS IN KANSAS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 2E.
W78-06580

8C. Hydraulic Machinery

FACTORS INFLUENCING OXYGEN INPUT IN AERATORS WITH VERTICAL SHAFT (AZ OXIGENBEVITELT BEFOLYOASOLO TENYEZOK A FUEGGOLEGES-TENGELYU FELUELETI LEVEGOZTETOKNEL),
M. Karoly.
Tatabanyai Szenbanyak Muszaki-Kozgazdasagi Koezlemenyei, Vol. 17, No. 1-2, p 12-16, 1977. 3 fig, 1 tab.

Descriptors: *Aeration, *Design criteria, *Oxygenation, *Equipment, *Operation and maintenance, *Dissolved oxygen, Aerobic conditions, Dimensions, Hydrualic design, Waste water treatment.

Design parameters of vertical shaft aerators and aerating basins which influence oxyen input were investigated. The oxygen input increases with the second power of the aerator diameter and with the second or third power of the circumferential speed; the efficiency is not influenced significantly by circumferential speeds in the range of 3.5-6.0 m/sec. Up to a certain level, oxygen input increases nearly linearly with the depth of immersion of the aerator. Although the oxygen input is intrinsically higher in rectangular basins then in circular ones, it can be increased in circular basins to yield an oxygen input of 1.7-1.9 kg/kWh by means of baffles which prevent or reduce the rotation of water around the aerator. For rectangular aeration basins, the specific oxygen input increases with a decrease in basin volume and is lower in rectangular shallow basins than it is in deeper basins of equal volume. Oxygen input is highest for rectangular basins having side length to water depth ratios in the range of 3-4:1. (Takacs-FIRL)
W78-06419

HYDRAULIC INVESTIGATION OF THE OPERATION OF DIFFERENT DESIGNS OF SECONDARY SETTLERS (IDRAVLICHESKOE ISSLEDOVANIE RABOT'L VTORICHNJIKH OTSTOINIKOV RAZLICH'IKH KONSTRUKCII),
I. V. Skirdov, and S. I. Kol'tsova.
Vodosnabzhenie i Sanitarnaia Tekhnika, No. 9, p 7-11, 1977. 4 fig, 6 ref.

Descriptors: *Separation techniques, *Sludge treatment, *Settling basins, *Design criteria, *Sedimentation rates, Equipment, Design criteria, Flow control, Operation and maintenance, Hydraulic design, Biological treatment, Sewage treatment, Waste water treatment.

Hydraulic characteristics of secondary vertical and radial settlers used in biological waste water treatment were examined. The performance of radial and vertical settlers was controlled by currents due to the difference in density between water and sludge. The currents generally limited to space utilization factor to less than 40%. Rotary distributors installed at the bottom of the settler were capable of increasing the space utilization factor to approximately 80-90%. The rotary distributors also increased the hydraulic load to a maximum of 2.2 cu m/sq m/hr, or nearly twice as high as that achieved in conventional radial settlers. (Takacs-FIRL)
W78-06420

CITY STORM SEWERS DUG IN CLOSE QUARTERS.
Highway and Heavy Construction, Vol 121, No 2, p 87, February, 1978.

Descriptors: *Hydraulic backhoe, *Storm drains, *Subsurface drainage, Equipment, *Sewers, *Conduits, Alluvium, Rock excavation, Earthworks, Trenches, Sewerage, Waste water disposal, Municipal wastes.

A hydraulic backhoe was utilized in a storm sewer construction project which required excavation in the proximity of buildings, trees and other objects. The RH 12 backhoe, equipped with a 48-inch bucket, was employed to excavate 4-5 ft wide trenches at depths ranging 3-16 ft for the installation of storm sewers and underdrains in Nanticoke, Pennsylvania. The hydraulic backhoe was required to dig through alluvial deposits, hard rock, pavement, concrete, and asphalt for the laying of 12-36 inch reinforced concrete storm conduits. Blasting of hard rock was occasionally necessary before excavation by the RH 12 hydraulic backhoe. The excavation time logged by the backhoe for several thousand feet of storm drain installation amounted to 450 hrs. The project also included the construction of sidewalks, driveway aprons, concrete curbs and gutters, asphalt paving, and landscaping. (Lisk-FIRL)
W78-06429

NEW PORTOBELLO OUTFALL.
For primary bibliographic entry see Field 5D.
W78-06436

PIPEFREEZING A SEWER.
Water Services, Vol 81, No 982, p 778, December, 1977.

Descriptors: *Pipelines, *Conduits, *Pumping plants, *Culverts, *Freezing, Nitrogen, Conveyance structures, Drains, Sewerage, Hydraulic structures, Waste water disposal, Municipal wastes.

Liquid nitrogen was used by BCB Pipefreezing Services Ltd of Croydon, England, to freeze a section of a sewer main that had to be rerouted. The 250 mm diameter pipeline, which carries sewage from the town of Brookend to a pumping station, was rerouted for the installation of a 4 by 8 ft concrete culvert at the same depth as that of the sewage main. A section of the pipe, constructed of spun cast iron, was isolated with insulated freezing jackets into which liquid nitrogen was injected. Freezing of the pipeline eliminated the necessity of draining the several mile long sewage main and shutting down the pumping station while the pipe was rerouted. Once the main was adequately frozen, the section of pipe was removed and the modifications were completed. (Lisk-FIRL)
W78-06437

OPTIMIZATION IN DESIGN OF PUMPING SYSTEMS,
Weston (Roy F.) Inc., West Chester, PA.
A. K. Deb.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 104, No EE1, p 127-136, February, 1978. 2 fig, 1 tab, 6 ref, 1 append.

Descriptors: *Pipes, *Pumping plants, *Cost analysis, *Optimization, *Capital costs, Operation and maintenance, Optimum development plans, Inflation(Economic), Mathematical models, Demand, Project planning, Waste water treatment, Municipal wastes.

A mathematical model for pipe diameter optimization in a pumping system incorporated capital costs, inflation factors, operation and maintenance expenses, and energy costs. Parameters considered for optimum pumping system planning included demand rate, installation timing, locality of use, salvage value, equipment life, head loss, viscosity, and liquid density. Energy requirements were higher for small diameter pipes which caused large friction heads and required larger pumps. Large diameter pipes reduced energy costs but increased pipeline cost factors. The capital cost of a pipeline system was expressed as a function of pipe diameter or as a function of flow and total head. For systems where population growth and resulting increased demands on a pumping system could be anticipated, a formula was presented for selecting the optimum year for pumping system expansion on the basis of an inflation factor, a demand factor, and the length of the planning period. (Lisk-FIRL)
W78-06439

STANDBY POWER.
Water Services, Vol 81, No 982, p 770, December, 1977.

Descriptors: *Pumping plants, *Generators, *Electrical power, *Electrical power failures, *Flooding, Electric power production, Standby power, Electrical equipment, Electrical power demand, Pumps, Sewerage, Waste water treatment, Municipal wastes.

Standby power generators, produced by Auto Diesels Braby Ltd of Uxbridge, Middlesex, England, supply backup power during electrical failures to pumping stations within England's Regional Water Authorities. The compact generators, both installed and mobile, provide power outputs of 20-480 kilovolts-ampere. The units can be set for either manual or automatic control, the latter especially important in unmanned pumping stations where power failure could mean immediate flooding. The automatically controlled generators supply power to the pumping station withing 20 sec of the main power failure. In pumping stations where power loss does not pose an immediate threat of flooding, mobile generators are transported to the pumping site. The Mobile Units provide the highest expected initial current required at the serviced pumping stations; the installed standby generators are programmed to provide the specific starting current required by the individual pumping station. The static generator is hooked into the main distribution switchboard at the station; the mobile generator is equipped with a control panel mounted on its own trailer. (Lisk-FIRL)
W78-06440

SHIELDHALL SEWAGE PURIFICATION WORKS--SPECIFICATION FOR AND SELECTION OF MECHANICAL EQUIPMENT AND PUMPS,
Strain and Robertson (Consulting Engineers, Glasgow (Scotland).
For primary bibliographic entry see Field 5D.
W78-06462

BELT PRESS BEATS SLUDGE DEWATERING PROBLEMS.
For primary bibliographic entry see Field 5D.
W78-06463

BASIC SEWAGE TREATMENT FOR SMALL COMMUNITIES.
For primary bibliographic entry see Field 5D.
W78-06486

TRUCK-TANKERS CLEAN SEPTIC TANKS IN RURAL AREAS,
For primary bibliographic entry see Field 5D.
W78-06488

8D. Soil Mechanics

EFFECTS OF WATER ON SLOPE STABILITY,
Kentucky Bureau of Highways, Lexington. Div. of Research.
T. C. Hopkins, D. L. Allen, and R. C. Deen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 860, Price codes: A03 in paper copy, A01 in microfiche. Research Report No. 435, Prepared for Federal Highway Administration, Washington, D.C., October 1975. 41 p, 27 fig, 1 tab, 60 ref. KYHPR-68-48; HPR-1(9).

Descriptors: *Slope stability, *Shear strength, *Embankments, *Safety factors, *Failure(Mechanics), Soil mechanics, Design criteria, Erosion, Monitoring, Clays, Effective stress, Pore pressure, Seepage, Atterberg limits, Soil moisture meters, Critical state, Total stress analysis.

A brief state-of-the-art review of the effects of water on slope stability and the techniques for analysis was presented. The derivations and effects of seepage forces and rapid drawdown on effective stress also were presented. Various conditions of external loading produce changes in effective stress. These changes were discussed, and limiting conditions which should be analyzed were mentioned. Limitations of total stress analyses were discussed in detail. It appears that, for soils having a liquidity index of 0.36 or greater (normally consolidated), the undrained shear strength gives factors of safety close to the actual factor of safety. For soils with a liquidity index less than 0.36 (overconsolidated), the undrained shear strength gives factors of safety that are too high; but the strength parameters can be corrected by the empirical relationship presented herein. Data also showed that the difference between vane and calculated shear strength increased as the plasticity index and or the liquid limit increased. An empirical relationship for correcting vane shear strength was presented. A discussion was presented of effective stress analysis, including differences between peak and residual phi angles for normally consolidated and overconsolidated soils. The residual phi angle decreased log arithmically with increasing clay fraction. The 'critical' state of a clay also was defined. Shear strength parameters of a clay tested in that state correspond to the theoretical strength of an overconsolidated clay which has undergone a process of softening. Water may cause unstable conditions in earth slopes due to changes in geometry. Erosion of the toe or the slope can induce damaging stress. Piping through heaving or erosion of subsurface layers can cause damage. Construction of side-hill embankments can cause damming, resulting in a rise in the water table. Methods of water detection also were summarized. A discussion of ways to monitor water pressures, including the types and operations of piezometers, was given. Finally, suggested guidelines for the design of earth slopes were included. (Adams-ISWS)
W78-06377

BURIED FLEXIBLE PIPE PERFORMANCE IN THE PROXIMITY OF NEW EXCAVATIONS,
Uni-Bell Plastic Pipe Association, Dallas, TX.
For primary bibliographic entry see Field 8G.
W78-06474

8F. Concrete

EVALUATION OF A CONCRETE BUILDING BLOCK REVETMENT,
Coastal Engineering Research Center, Fort Belvoir, VA.
M. L. Giles.
Army Coastal Engineering Research Center Reprint 78-5, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 686-695, 9 fig, 4 ref.

Descriptors: *Beach erosion, *Shore protection, *Concrete structures, Erosion, Resources development, Revetments, Environmental conditions.

The results of a two-dimensional laboratory evaluation of a beach revetment plan that uses common concrete building blocks as the revetment armor unit is presented. Common concrete building blocks were evaluated to aid the owner of property situated along a sheltered coast. The revetment was evaluated to determine: (1) the maximum breaking wave height for which the revetment is effective, (2) the nature and cause of revetment failures, (3) the extent of toe scour for various wave conditions, (4) filter requirements, (5) effect of wave overtopping of the revetment, and (6) the ease of installation under simulated field conditions. Results of this two-dimensional prototype scale evaluation indicate that the plan as tested could be installed easily by a homeowner and would effectively protect a beach from 0.90 meter high breaking waves. (Sinha-OEIS)
W78-06248

PIPELINE FLOATED ACROSS RIVER.
Water and Wastes Engineering, Vol 15, No 1, p 32, January, 1978.

Descriptors: *Conduits, *Sewerage, *Construction joints, *Pipes, *Bridges, Concrete pipes, Pipelines, Trenches, Underwater, Virginia, Sheet piling, Steel piles, Piles(Foundations), Cranes, Floating, Waste water treatment, Treatment facilities, Municipal wastes.

A prestressed concrete sewer main, connecting the York County, Virginia, treatment facility with a large southern treatment plant, was settled into position in Virginia's Poquoson River. The sewer line, with a diameter of 42 inches, is part of a sewer force main encompassing over 30,000 ft of 42 and 30 inch pipes. The main was constructed with movable ball joints, allowing flexible conformity of up to 15 degrees to the river bed. As the pipe sections were joined, they were floated across the river by a cable from the opposite shore. A wooden pile bridge was constructed parallel to the line to provide a support structure for seven cranes which aided in the installation. Filling in of the trench, excavated on the river bottom for the sewer main, was prevented in a marshy portion of the shore by steel sheet pilings. Once the pipe was floated across the river, it was settled by pumping of water through the line. (Lisk-FIRL)
W78-06434

DIRTY 'OLE MAN RIVER' GETTING CLEANED UP.
Water and Wastes Engineering, Vol 15, No 1, p 44, January, 1978.

Descriptors: *Sewerage, *Conduits, *Interceptor sewers, *Pumping plants, *Mississippi River, Hydraulic structures, Conveyance structures, Treatment facilities, Waste water treatment, Municipal wastes.

A $2.8 million interceptor sewer and pumping station for the President's Island section of Memphis, Tennessee, has a maximum daily flow capacity of 21 million gallons of municipal and industrial wastes. The interceptor sewer consists of four miles of gravity sewer line and two miles of force main, 2000 linear feet of which was submerged into place in a channel of the Mississippi River. The larger concrete gravity sewer lines, with diameters ranging 12-42 inches, were lined with coal tar epoxy to prevent hydrochloric acid corrosion. The force main lines, with diameters of 4-30 inches, are supplemented by four lift stations in areas of deep pipe excavation. The President's Island pumping station is equipped with two variable speed and two constant speed pumps with capacities of 4,900 gal/min. The pumping station wet wells are designed to transform stress into compression, reducing the need for thick walls. The pumping station will ultimately discharge the effluent into a waste water treatment facility in Memphis. (Lisk-FIRL)
W78-06435

8G. Materials

UTILIZATION OF BRACKISH WATER IN COAL GASIFICATION,
New Mexico State Univ., University Park. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 3E.
W78-06204

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX M-DREDGING TECHNOLOGY.
JBF Scientific Corp., Wilmington, MA.
For primary bibliographic entry see Field 5E.
W78-06259

NEW SHALLOW SEWER BEATS HIGH COST OF DEEP GRAVITY SYSTEM,
N. Hancock.
Engineering and Contract Record, Vol 91, No 1, p 20-21, January, 1978. 1 fig.

Descriptors: *Sewerage, *Thermal insulation, *Plastics, *Pipes, *Gravity, Manholes, Plastic pipes, Pumping plants, Pumps, Waste water treatment, Permafrost, Water table, Municipal wastes.

A shallow depth sewage system which includes polyethylene pipes and grinder pumps has been installed in the Canadian Toronto Islands. Special construction techniques were required because of the area's high water table, flat terrain, and permafrost. Polyethylene pipe sections, up to 300 feet in length, were joined with a butt fuser machine and insulated with 2 inches of water repellant styrofoam. The pipes were buried beneath three feet of covering to guard against frost. The manholes were also insulated with 2 inches of styrofoam; chamber valves and piping were wrapped with styrofoam half-shells and polyethylene tape. The 28,000 feet of pipe serves the year-round system and the summer recreational facilities. The system contains 30 pumping stations with 125 gal/min centrifugal grinder pumps serving the larger usage areas. Three pumps, one 75 hp for summer use, one 10 hp for winter months, and one backup pump, are employed in the system. Sewage is eventually discharged into the Toronto interceptor sewer. (Lisk-FIRL)
W78-06430

UPDATING AND COMPLETING SEWER RECORDS COULD COST LESS THAN YOU THINK.
Surveyor, Vol 151, No 4465, p C1, January, 1978. 1 fig.

Descriptors: *Conduits, *Sewerage, *Manholes, *Outlets, *Outfall sewers, Surveys, Mapping, Data collections, Electrical equipment, Sewers, Pipelines, Waste disposal, Municipal wastes.

A survey of all manholes, sewer lines, and outfalls in the London Borough of Waltham Forest in England was completed within two years at a substantial savings. The first phase of the project involved visual inspection of all manholes, conduits, and outfalls in the three divisions of the borough. The second phase of the survey required a study of existing sewer records which outlined some of the routes of old sewer lines not located along public highways. Each manhole was examined for pipe size, depths, and structural defects; precise locations of sewer lines were identified with electroprobe equipment. The electroprobe survey detailed the location of old sewer lines constructed on curves or sharp bends. A total of 10,786 manholes, 372 lampholes, and 213 outfalls were investigated in the survey. The final cost of the project, which was estimated at 50,000 pounds sterling, was 29,000 pounds sterling after the collation of the survey data. (Lisk-FIRL)
W78-06432

MEASURING PRESSURE SURGES IN PIPELINES.
Water and Waste Treatment, Vol 20, No 10, p 26, October, 1977. 2 fig.

Descriptors: *Pipelines, *Pressure measuring instruments, *Water pressure, *Measurement, *Sewerage, Head loss, Flow, Pressure, Surges, Waste water disposal, Municipal wastes.

Transducers (CEL) of Reading, England, has developed a bonded strain gauge pressure transducer for the measurement of pressure surges in pipelines. The Water Research Center in Medmenham, Bucks, England, used the transducer to measure pipeline surges in an attempt to prevent pressure-related pipeline damages. The DataSense 1000, capable of optimizing pump switching timing or measuring static or dynamic pressures in pipes, was modified from 0-500 lbs/sq in to 0-1.5 lbs/sq in and 0-375 lbs/sq in. The transducer was used in conjunction with a portable pressure indicator and a chart recorder. An isolating valve with an integral bleed value was positioned in the pipeline to be tested. Air trapped in the pipeline was released by the bleed valve which was then shut. The isolating valve was then opened and the pressure was measured. Positioning of the transducer is dependent upon the type of pipeline being measured. (Lisk-FIRL)
W78-06433

A TOUGH CONTENDER FOR PIPEWORK. SIMPLE AS ABS,
J. Maitland.
Process Engineering, p 107, 109, 111, October, 1977. 2 fig, 2 tab.

Descriptors: *Acrylonitrile butadiene styrene, *Plastic pipes, *Conduits, *Heat resistance, *Corrosion, *Pipes, Iron, Copper, Steel pipes, Radiation, Industrial wastes, Solvents, Ductility.

Acrylonitrile butadiene styrene (ABS) plastic is replacing lead, copper, cast iron, and steel as the preferred material for drain, waste, and vent pipes. The ABS plastic has superior heat resistance and greater ductility at low temperatures than polyvinyl chloride pipes. The absence of noxious combustion products is an additional advantage of ABS pipes. Industrial uses of ABS material include the transport of chemicals, slurries, effluents, and compressed air, as well as mine and quarry applications. Food and water supplies can be transported through this material because of its nontoxicity. A newer use of ABS is for pipe casings; installations to a depth of 600 ft have been achieved. ABS offers light weight, a high modulus, abuse resistance, heat resistance, and suitability for potable water. The quality of ABS is dependent upon the processing and the use of high molecular weight ABS resin. ABS pipes, with solvent welded or rubber joints, are resistant to low levels of radiation in nuclear power stations. (Lisk-FIRL)
W78-06438

BURIED FLEXIBLE PIPE PERFORMANCE IN THE PROXIMITY OF NEW EXCAVATIONS,
Uni-Bell Plastic Pipe Association, Dallas, TX.
W. D. Nesbeitt.
Public Works, Vol 109, No 3, p 80-81, March, 1978. 2 fig.

Descriptors: *Pipes, *Flexibility, *Soil stability, *Sewerage, *Excavations, Trenches, Soil properties, Soil pressure, Soil strench, Hydraulic structures, Pipelines, Waste water treatment, Analytical techniques, Municipal wastes.

Precautions for excavating in the vicinity of buried flexible pipe are reviewed and equations for calculating critical trench depth and safe separation distance are presented. The safe separation distance is a function of pipe diameter, depth of soil cover over the pipe, and the critical trench depth in a vertical excavation. The minimum safe separation for a highly flexible pipe is equal to the least amount of horizontal soil cover required between the pipe and the open trench to prevent shift or collapse of the trench wall. The critical trench depth is calculated with estimated values for soil cohesion, unit weight of the soil, and the friction angle of the trench wall soil. When the minimum safe horizontal separation is not established, a soil wedge may form by deterioration of the flexible pipe support, pushing into the open trench. The effect of soil failure upon the flexible pipe is related to the weight of the soil wedge, the stiffness of the pipe ring, and the failure arc of the soil shear plane. Pipe flexibility is considered a monor factor in estimating the response of buried pipe to adjacent excavation. (Lisk-FIRL)
W78-06474

THE DEVELOPMENT, MANUFACTURE AND APPLICATIONS OF GLASS REINFORCED PLASTIC PIPES,
L. T. Cooper.
Anti-Corrosion Methods and Materials, Vol 25, No 2, p 3, 5, 7, 10, February, 1968. 1 tab, 6 ref.

Descriptors: *Glass-reinforced plastics, *Pipes, *Plastic pipes, *Corrosion control, *Pressure conduits, *Steel pipes, Linings, Drainage systems, Conveyance structures, Chemical wastes, Flow, Waste water treatment, Sewerage.

The development, manufacture, applications, and costs of glass-reinforced plastic pipes are reviewed. The longitudinal and circumferential strengths of pipes are reinforced with biaxial or helical winding of resin-impregnated glass fiber. In the Redland Pipes Ltd plant in Parkstone, England, a biaxial winding machine is employed for pipes with diameters of 300-2,000 mm, and a combined helical and biaxial machine for pipes having diameters of 300-4,800 mm. Glass reinforced plastic pipe has a strength to weight ratio seven times that of steel; it is light weight, corrosion resistant, abrasion resistant, and non-toxic and not resistant to flow. The ability of glass-reinforced plastic pipe to withstand heavy loads and corrosives makes it suitable for sewage and drainage installations. The plastic pipes are capable of resisting the high and low internal pressures experienced in rising mains and pressure pipelines; its resistance to tainting, toxins, and microbial growth makes it suitable for potable water conveyance. The cost of glass-reinforced plastic pipe is less than that of polypropylene, chloride, and stainless steel pipe. Plastic pipe is cost competitive with mild steel pipes in the larger diameter ranges. (Lisk-FIRL)
W78-06476

DEEP SHAFT SYSTEM USES GRP.
For primary bibliographic entry see Field 5D.
W78-06481

COMPUTER CONTROLS PIPELINE FLOW.
Water and Waste Treatment, Vol 20, No 12, p 34-35, December, 1977. 1 fig.

Descriptors: *Analog computers, *Digital computers, *Pipelines, *Treatment facilities, *Automatic control, Telemetry, Monitoring, Flood control, Flood routing, Waste water treatment, Municipal wastes.

The Eindhoven sewage treatment plant in the Netherlands, designed to treat effluent from a maximum potential population of 750,000 and an expanding industry, is controlled by a Philips P800 minicomputer with telemetry links. The computer system also monitors and controls the flow in the 46 km long pipeline through which sewage is transported to the treatment facility. A P855 computer collects and displays data in the central control room on measurements of levels, flows, motor currents, and operating hours. Computer control of the six sewage pumps located between the coarse screens and the grit remover has maximized pump efficiency by operating the pumps in sequential order according to the monitored effluent levels in the three supply channels. The computer operates the sewage transport pipeline as a buffer reservoir by incorporating monitored pipeline data into a simulated model of the line. Flow data relayed to the computer by the telemetry system allows the balance of water levels in the pipeline for optimal buffer capacity, and prevents or controls overflows. Control stations and a pumping station along the pipeline route are also under computer control. (Lisk-FIRL)
W78-06513

SAFETY OF DAMS, A REVIEW OF THE PROGRAM OF THE U. S. BUREAU OF RECLAMATION FOR THE SAFETY OF EXISTING DAMS.
National Research Council, Washington, D.C. Committee on the Safety of Dams.
For primary bibliographic entry see Field 8B.
W78-06522

CLEANING APPARATUS FOR SEWER PIPES AND THE LIKE,
T. E. Jones.
United States Patent 4,073,302. Issued February 15, 1978. Official Gazette of the United Patent Office, Vol. 967, No. 2, p 473, February, 1978. 1 fig.

Descriptors: *Pipes, *Cleaning, *Conduits, *Scour, *Patents, *Design data, Pressure, Equipment, Sewers, Waste water treatment, Waste water disposal, Municipal wastes.

An apparatus for cleaning the interiors of sewage pipes and other conduits with compressed cleaning fluid has been patented. The cleaning apparatus consists of a tubular body containing a cylindrical bore with a nozzle at one end and an inlet conduit on the other. The conduit is connected to a supply of pressurized cleaning fluid which is sprayed into the pipes through the nozzle at the other end of the bore. The nozzle is divided into two chambers, the first having a larger diameter than the second. A wall separates the second chamber from the first chamber, equipped with a number of jets through which the cleaning fluid is discharged under pressure. The entire apparatus is mounted on two sets of hubs, each containing three legs. The legs have rotating wheels and pivotal skids which engage with the interior of the pipes. The skids may be rotated perpendicular to the tubular body of the apparatus. (Lisk-FIRL)
W78-06568

GEOTHERMAL POWER SYSTEM,
J. S. Swearingen.
U.S. Patent No 4,054,175, 10 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 963, no 3, p 880, October 18, 1977.

Descriptors: *Patents, *Geothermal studies, *Thermal properties, *Scaling, Heat transfer, Heat exchangers.

An object of the invention is to provide a system of extracting heat from hot unrefined water by passing the hot unrefined water directly through conventional heat exchange apparatus. Scaling and other solid build-up of impurities from the water is prevented in the hot water well casing and water transport equipment as well as in the heat exchange equipment. The agents for beneficially treating the water are derived directly from the source of hot unrefined water. The improvement involves adding to the hot unrefined water prior to its contact with the heat exchange surface, an agent capable of increasing the formation of non-scale-forming species of the scale-forming impurities whereby scaling and other solid build-up on the heat exchange surface, particularly upon cooling of the water, is minimized. Non-scale-forming species are those which remain in solution or suspension in the unrefined water as it is passed through the heat exchange apparatus without forming scale and/or those which are harmlessly precipitated, e.g. solid non-scale particles which are small enough to remain in suspension in the moving water and be carried out of the heat exchange apparatus. (Sinha-OEIS)
W78-06659

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

ANNUAL REPORT 1973 - 1974.
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 9D.
W78-06350

ANNUAL REPORT FISCAL YEAR 1976, TO THE OFFICE OF WATER RESEARCH AND TECHNOLOGY.
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 9D.
W78-06355

ANNUAL REPORT OF THE IOWA STATE WATER RESOURCES RESEARCH INSTITUTE FOR FY 1976.
Iowa State Water Resources Research Inst. Ames.
For primary bibliographic entry see Field 9D.
W78-06365

CATALOG OF WATER RESOURCES RESEARCH IN ILLINOIS.
Illinois Univ. at Urbana-Champaign. Water Resources Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 561, Price codes: A06 in paper copy, A01 in microfiche. Special Report No. 7, July 1977, 106 p.

Descriptors: *Water resources research, *Research and development, *Illinois, Water research institute, State agencies, Government agencies, *Research projects, Research facilities.

One of the responsibilities of the Water Resources Center is to collect and compile information on water resources research projects being conducted by institutions and agencies in Illinois. That information, needed to avoid duplication of research efforts, is published in this catalog to improve communication among research units and to help inform users of research information in Illinois. The research projects are listed by investigating agency. Most of the projects were considered active as of June 1977. A subject index is presented in the appendix. Researchers and users of research results who have a need for more information about specific projects should direct their inquires to the principal investigator at the agency or institution listed.
W78-06412

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT 1973 - 1974.
Hawaii Univ., Honolulu. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 621, Price codes: A05 in paper copy, A01 in microfiche. 1975. 76 p, 6 fig. OWRT A-999-HI(12).

Descriptors: *Water resources, *Water resources development, *Hawaii, Research and development, Water supply, Groundwater, Waste disposal, Forecasting, Surface waters, Water pollution, Information exchange.

Research issues of special relevance to Hawaii (water supply drawing from natural groundwater sources, drought, flooding, and domestic discharges of waste waters into coastal and surface waters, surface water ownership, and water resources forecasting) are reviewed, and research relating to these and other areas is described. Research allotment projects carried on during 1973 and 1974 treated watershed pollution, water demand, radiation well logging, water infiltration analysis, water resources, sedimentation, groundwater pollution, fog precipitation, analysis of time patterns of water use, sewage treatment, and volcanic contamination of rainwater. Matching grant projects described were concerned with rainfall space/time variations, urban hydrology and water resources, water distribution optimization, and water problem analysis. Non-OWRR projects described included those concerned with coastal water quality, sewage effluent recycling, sewage monitoring and analysis, water pollution, water resources, and water quality information storage and retrieval. Publications and personnel are listed. (Wares-IPA)
W78-06350

ANNUAL REPORT FISCAL YEAR 1976, TO THE OFFICE OF WATER RESEARCH AND TECHNOLOGY.
Utah Center for Water Resources Research, Logan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 362, Price codes: A05 in paper copy, A01 in microfiche. Annual Report, August, 1976. 87 p, 8 fig, 7 tab, 2 append. OWRT A-999-UTAH(4), 14-34-0001-6046.

Descriptors: *Water resources development, *Utah, *Water Resources Institute, *Research and development, Water quality control, Water quality standards, Water pollution treatment, Projects, *Annual report, *Fiscal year 1976.

Annual status reports are presented for 10 annual allotment projects (Title I), 10 matching grant projects (Title I), and 5 Title II projects. Project accomplishments, publications, and status; the application of research results; work remaining; and projected accomplishments are described. The status of training and education programs is reported. The introduction cites long-range goals, priorities, and problems and organizational changes. (Seip-IPA)
W78-06355

ANNUAL REPORT OF THE IOWA STATE WATER RESOURCES RESEARCH INSTITUTE FOR FY 1976.
Iowa State Water Resources Research Inst. Ames.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 617, Price codes: A08 in paper copy, A01 in microfiche. Annual Report, July, 1976. 163 p, 2 tab, 1 append. OWRT A-999-IA(14).

Descriptors: *Water resources development, *Iowa, *Water Resources Institute, *Research and development, Waste water treatment, Projects, *Annual report, *Fiscal year 1976, *Iowa State Water Resources Research Institute, Project status report.

Status reports are presented for 12 annual allotment projects and 10 matching grant projects. Project accomplishments, publications, applications of research results, outlines of remaining work and anticipated accomplishments are described. Five new annual allotment projects and 2 new matching grant projects for the transition quarter and FY 1977 are also described. The director's statement cites drought as the major problem facing water resource management efforts; long-range goals and problems and the status of the training and education programs are delineated in the director's report. Publications, completion reports, theses and dissertations are listed. (Seip-IPA)
W78-06365

CATALOG OF WATER RESOURCES RESEARCH IN ILLINOIS.
Illinois Univ. at Urbana-Champaign. Water Resources Center.
For primary bibliographic entry see Field 9A.
W78-06412

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

BIBLIOGRAPHY ON COLD REGIONS SCIENCE AND TECHNOLOGY, VOLUME XX-VIII, PT. 1.
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-06232

ANNUAL REPORT 1973 - 1974.
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 9D.
W78-06350

ANNUAL REPORT FISCAL YEAR 1976, TO THE OFFICE OF WATER RESEARCH AND TECHNOLOGY.
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 9D.
W78-06355

ANNUAL REPORT OF THE IOWA STATE WATER RESOURCES RESEARCH INSTITUTE FOR FY 1976.
Iowa State Water Resources Research Inst. Ames.
For primary bibliographic entry see Field 9D.
W78-06365

A PLAN TO IMPROVE THE WATER RESOURCES SCIENTIFIC INFORMATION CENTER PROGRAM,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 10D.
W78-06373

MATHEMATICAL MODELING AND ECONOMIC OPTIMIZATION OF WASTE-WATER TREATMENT PLANTS,
Louvain Univ. (Belgium). Dept. of Engineering.
For primary bibliographic entry see Field 5D.
W78-06415

BIOLOGICAL OIL SLICKS. PART I - LITERATURE EXAMINATION,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 5B.
W78-06536

STATUS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX)--SEPTEMBER 1977,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06607

10D. Specialized Information Center Services

RESEARCH IN ACTION: TECHNOLOGY FOR IMPLEMENTING WATER RESEARCH RESULTS. PROCEEDINGS OF A CONFERENCE, DECEMBER 5 - 6, 1974, LINCOLN, NEBRASKA.
Nebraska Univ., Lincoln. Water Resources Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 337, Price codes: A05 in paper copy, A01 in microfiche. (1975). 82 p, 2 fig, 3 tab, 8 ref, 1 append. OWRT A-999-NEB(17).

Descriptors: *Conferences, *Water resources, *Water quality, *Research and development, Nebraska, *Technology, Communication, Planning, Information exchange, Lincoln(NB), *Technology transfer.

A conference concerning the implementation of water research results explored practical techniques for expediting the transfer of such information. Although a significant portion of water research results can be applied in practical situations, there is often a significant time delay between the accomplishment of the research and its first important application; the lack of systematic feedback from practical applications of water research was also noted. Some specific characteristics of the human communication problem regarding application of such research were identified as differences between problem-oriented research and water resources problem solving and the large volume of scientific and technical literature which is unstructured in terms of problem applications. Other aspects of research results implementation discussed were State and Federal water planning, the University's role in utilization, and the Research Applied to National Needs (RANN) program. Panel discussions were held on the need for effective research translation, and workshops were conducted on how to achieve action from research. The appendix lists conference participants. (Wares-IPA)
W78-06370

A PLAN TO IMPROVE THE WATER RESOURCES SCIENTIFIC INFORMATION CENTER PROGRAM,
Massachusetts Univ., Amherst. Water Resources Research Center.
B. B. Berger, J. J. Knightly, L. W. Weinberger, and C. A. Wogrin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 272, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, April 1976, 53 p. OWRT X-152(No. 5264)(1).

Descriptors: *Information exchange, *Information retrieval, *Scientific information center, Data storage and retrieval, Communication, *Documentation, Abstracting, Indexing, *Bibliographies, *Reviews, Data collections, *Information dissemination.

The WRSIC system can be improved by the following: (1) improve coverage, (2) improve user awareness, (3) improve accessibility, (4) improve quality of services, and (5) strengthen user support. It was determined that these objectives could be met by describing three specific investigations, and a supplemental study which, when completed, should provide a useful basis for guiding WRSIC's future development. The investigations focus on: (1) adequacy of coverage of the system; (2) assessment of attitudes and values of potential users; and (3) a study of optimized user access to the system. The supplemental study focuses on the quality of information provided by WRSIC.
W78-06373

STATUS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX)--SEPTEMBER 1977,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 07C.
W78-06607

10F. Preparation Of Reviews

MATHEMATICAL MODELING AND ECONOMIC OPTIMIZATION OF WASTE-WATER TREATMENT PLANTS,
Louvain Univ. (Belgium). Dept. of Engineering.
For primary bibliographic entry see Field 05D.
W78-06415

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid L ands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

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ABSTRACT SOURCES

NORTH AMERICAN CONTINENT PRICE SCHEDULE

Customers in Canada, U.S., and Mexico please use this price schedule; other addressees write for Folder PR-360-4.

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A04	5.25	E04	7.50	T04	250.00
A05	6.00	E05	9.00	T05	300.00
A06	6.50	E06	10.50	T06	350.00
A07	7.25	E07	12.50	T07	400.00
A08	8.00	E08	15.00	T08	450.00
A09	9.00	E09	17.50	T09	500.00
A10	9.25	E10	20.00	T10	550.00
A11	9.50	E11	22.50	T11	600.00
A12	10.75	E12	25.00	T12	650.00
A13	11.00	E13	28.00	T13	675.00
A14	11.75	E14	31.00	T14	750.00
A15	12.00	E15	34.00	T15	800.00
A16	12.50	E16	37.00	T16	850.00
A17	13.00	E17	40.00	T17	900.00
A18	13.25	E18	45.00	T18	950.00
A19	14.00	E19	50.00	T19	1,000.00
A20	14.50	E20	60.00	T99	*
A21	15.00	E99	*		
A22	15.25				
A23	15.50	N01	28.00		
A24	16.25	N02	50.00		
A25	16.50				
A99	*				

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